Exhibit 3

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Anton Monk et al.		
U.S. Patent No.:	7,889,759	Attorney Docket No.:	45035-0026IP1
Issue Date:	February 15, 2011		
Appl. Serial No.:	10/889,975		
Filing Date:	July 12, 2004		
Title:	BROADBAND CABLE NETWORK UTILIZING COMMON BIT-LOADING		

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PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT NO. 7,889,759 PURSUANT TO 35 U.S.C. §§ 311-319, 37 C.F.R. § 42

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LIST OF EXHIBITS

DISH-1001	U.S. Patent No. 7,889,759 to Anton Monk et al. ("'759 patent")
DISH-1002	Complaint from *Entropic Communications, LLC v. DISH Network Corporation et al.*, Case 2:23-cv-01043, ECF No. 1 (C.D. Cal. Feb. 10, 2023)
DISH-1003	Proof of Service of Summons and Complaint on DISH Network Corporation in *Entropic Communications, LLC v. DISH Network Corporation et al.*, Case 2:23-cv-01043, ECF No. 14 (C.D. Cal. Feb. 23, 2023)
DISH-1004	Declaration of Tim A. Williams, Ph.D.
DISH-1005	File History for the '759 patent
DISH-1006	U.S. Patent Appl. Pub. No. 2009/032851 to Fuyun Ling et al. ("Ling")
DISH-1007	U.S. Patent Appl. Pub. No. 2009/0279498 to Xiaodong Li et al. ("Li")
DISH-1008	U.S. Patent Appl. Pub. No. 2005/0031044 ("Gesbert")
DISH-1009	U.S. Patent No. 6,622,304 to Thomas W. Carhart ("Carhart")
DISH-1010	U.S. Patent No. 5,495,483 to Gary W. Grube et al. ("Grube")
DISH-1011	U.S. Patent Appl. No. 10/322,834 ("'834 priority application")
DISH-1012	U.S. Patent Appl. Pub. No. 2003/0002518 to Akira Shibutani ("Shibutani")
DISH-1013	U.S. Patent No. 6,205,410 to Lujing Cai ("Cai")
DISH-1014	U.S. Patent No. 6,480,497 to George H. Flammer, III et al. ("Flammer")

DISH-1015	Declaration of June Munford
DISH-1016	Microsoft Computer Dictionary, Fourth Ed., 1999 (“Microsoft”)
DISH-1017	Newton’s Telecom Dictionary, The Official Dictionary of Telecommunications Networking and Internet, July 2000 (“Newton’s”)
DISH-1018	Sharda, Nalin K., Multimedia Information Networking, 1999 (“Sharda”)
DISH-1019	Webster’s New World Dictionary of Computer Terms, Eighth Edition, 2000 (“Webster’s”)
DISH-1020	Federal Court Management Statistics for September 2023 published by the Administrative Office of the U.S. Courts, retrieved from https://www.uscourts.gov/sites/default/files/data_tables/fcms_na_distcomparison0930.2023.pdf
DISH-1021	LegalMetric Time to Trial Report, Central District of California, Patent Cases (Jan. 2021-Nov. 2023)
DISH-1022	Order Granting Stipulation Setting Claim Construction Schedule, from *Entropic Communications, LLC v. DISH Network Corporation et al.*, Case 2:23-cv-01043, ECF No. 1 (C.D. Cal. Aug. 21, 2023)
DISH-1023	U.S. Patent No. 7,295,518 to Anton Monk et al. (“’518 patent”)
DISH-1024	U.S. Patent No. 7,594,249 to Itzhak Gurantz et al. (“’249 patent”)
DISH-1025	U.S. Patent No. 6,252,900 to Young Way Liu et al. (“Liu”)
DISH-1026	U.S. Patent No. 4,679,227 to Dirk Hughes-Hartogs (“Hughes-Hartogs”)

DISH-1027	U.S. Patent No. 6,259,746 to Howard E. Levin et al. ("Levin")
DISH-1028	U.S. Patent No. 6,072,779 to Marcos Tzannes et al. ("Tzannes")
DISH-1029	U.S. Patent No. 4,866,395 to G. Robert Hostetter ("Hostetter")
DISH-1030	U.S. Patent No. 6,298,092 to Robert W. Heath et al. ("Heath")

LISTING OF CHALLENGED CLAIMS

Claim Language		
[1pre] A method for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in a broadband cable network ("BCN"), the method comprising:	**[2pre]** A method for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in a broadband cable network ("BCN"), the method comprising:	**[3pre]** A method for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in a broadband cable network ("BCN"), the method comprising:
[1a] transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;	**[2a]** transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;	**[3a]** transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;

Claim Language		
[1b] receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node; and	**[2b]** receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node;	**[3b]** receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node; and
[1c] determining the common bit-loading modulation scheme from the received plurality of response signals;	**[2c]** determining the common bit-loading modulation scheme from the received plurality of response signals;	**[3c]** determining the common bit-loading modulation scheme from the received plurality of response signals;

Claim Language		
[1d] receiving the probe signal at one receiving node of the plurality of receiving nodes through a channel path of transmission;	**[2d]** receiving the probe signal at one receiving node of the plurality of receiving nodes through a channel path of transmission;	**[3d]** receiving the probe signal at one receiving node of the plurality of receiving nodes through a channel path of transmission;
[1e] determining the transmission characteristics of the channel path at the one receiving node; and	**[2e]** determining the transmission characteristics of the channel path at the one receiving node;	**[3e]** determining the transmission characteristics of the channel path at the one receiving node; and
[1f] transmitting a response signal from the one receiving node to the transmitting node,	**[2f.i]** transmitting a response signal from the one receiving node to the transmitting node,	**[3f]** transmitting a response signal from the one receiving node to the transmitting node,

Claim Language		
[1g] wherein the transmission characteristics of the channel path are determined by measuring the signal-to-noise ("SNR") characteristics of the received probe signal at the one receiving node and	**[2f.ii]** wherein the transmission characteristics of the channel path are determined by measuring the bit-error rate ("BER") characteristics of the received probe signal at the one receiving node and	**[3g]** wherein the transmission characteristics of the channel path are determined by measuring the signal-to-noise ("SNR") characteristics of the received probe signal at the one receiving node,

Claim Language		
	[2g] generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the one receiving node in response to determining the transmission characteristics of the channel path,	**[3h]** wherein the transmission characteristics of the channel path are determined by measuring the [packet]-error rate ("PER") characteristics of the received probe signal at the one receiving node, and
[1h] wherein determining a common bit-loading modulation scheme includes:	**[2h]** wherein determining a common bit-loading modulation scheme includes:	**[3i]** wherein determining a common bit-loading modulation scheme includes;

Claim Language		
[1i] comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and	**[2i]** comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and	**[3j]** comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and
[1j] determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.	**[2i]** determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.	**[3k]** determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.

I. INTRODUCTION

Upon receiving an application with 81 original claims, the Examiner rejected 57 claims and objected to the remainder. Each objected-to claim required comparing a plurality of bit-loading modulation schemes received from a plurality of secondary sites to determine a common bit-loading scheme for subsequent communications, which is simply choosing the most-efficient common scheme that multiple channels can use. Applicant amended the rejected claims to include these limitations, and the application was allowed.

Grube, which was not before the Examiner, teaches an operation in which "bit loading tables" received from secondary sites are compared to determine a common bit-loading scheme for subsequent operation which renders obvious the techniques that led to allowance. Because Grube renders obvious the '759 patent's key concept, the challenged claims would have been obvious, and the Board should institute review.

II. REQUIREMENTS FOR IPR

A. Standing

DISH Network Corporation, DISH Network L.L.C., Dish Network Service L.L.C., and Dish Network California Service Corporation (collectively, "DISH") certify that the '759 patent is available for IPR and DISH is not barred or estopped from requesting review. This Petition is filed within one year of service of a

complaint against DISH in the U.S. District Court for the Central District of California ("District Court"). *See* DISH-1002; DISH-1003.

B. Challenge and Relief Requested

This Petition demonstrates a reasonable likelihood of prevailing as to at least one Challenged Claim. DISH requests institution of IPR and cancellation of all Challenged Claims on the grounds identified below. Dr. Tim Williams's expert declaration, DISH-1004, provides supplemental explanation and support.

Ground	Challenged Claims	§103 Basis
1	1-3	Carhart in view of Grube
2	1-3	Carhart in view of Grube and Shibutani
3	1	Carhart in view of Grube and Cai
4	2-3	Carhart in view of Grube, Shibutani and/or Cai, and further in view of Flammer

Each reference pre-dates 2001-05-04, which is the earliest possible date to which the '759 patent can claim priority.[1]

Reference	Prior Art Date	Statutory Basis (at least under)
Carhart	1997-08-06 (filed)	§102(e)
Grube	1996-02-27 (issued)	§102(b)

[1] Petitioner does not concede that the '759 patent is entitled to the priority claimed.

Reference	Prior Art Date	Statutory Basis (at least under)
Shibutani	2001-04-05 (filed)	§102(e)
Cai	1998-10-13 (filed)	§102(e)
Flammer	1998-11-23 (filed)	§102(e)

C. Claim Construction

Because the Challenged Claims are obvious under any reasonable interpretation, no express constructions are required in this proceeding. *See Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) ("claim terms need only be construed to resolve a controversy"). DISH reserves the right to address constructions the Patent Owner (PO) or Board proposes. DISH also reserves the right to pursue constructions in district court that are necessary to decide matters of infringement and validity under §112 that exceed the scope of IPR. *See* 35 U.S.C. §311(b). DISH does not concede that the Challenged Claims satisfy statutory requirements, including §112.

III. THE ’759 PATENT[2]

A. Summary

The ’759 patent describes a broadband cable network (“BCN”) with nodes that determine a common bit-loading modulation scheme for broadcasting between multiple nodes (e.g., A, B, C, etc.). *See* DISH-1001, Abstract, 6:55-7:4; DISH-1004, ¶¶28-50.[3] The ’759 patent depicts broadcasting through Figures 6 and 7—node A sends the same message to node B (path 640) and node C (path 740):

[2] All annotation and emphasis has been added.

[3] Coaxial cabling, splitters, bit-loading, and modulation schemes for multi-device communications were well-known. DISH-1004, ¶¶29-37; DISH-1025, 8:14-31; DISH-1023, 8:19-26.

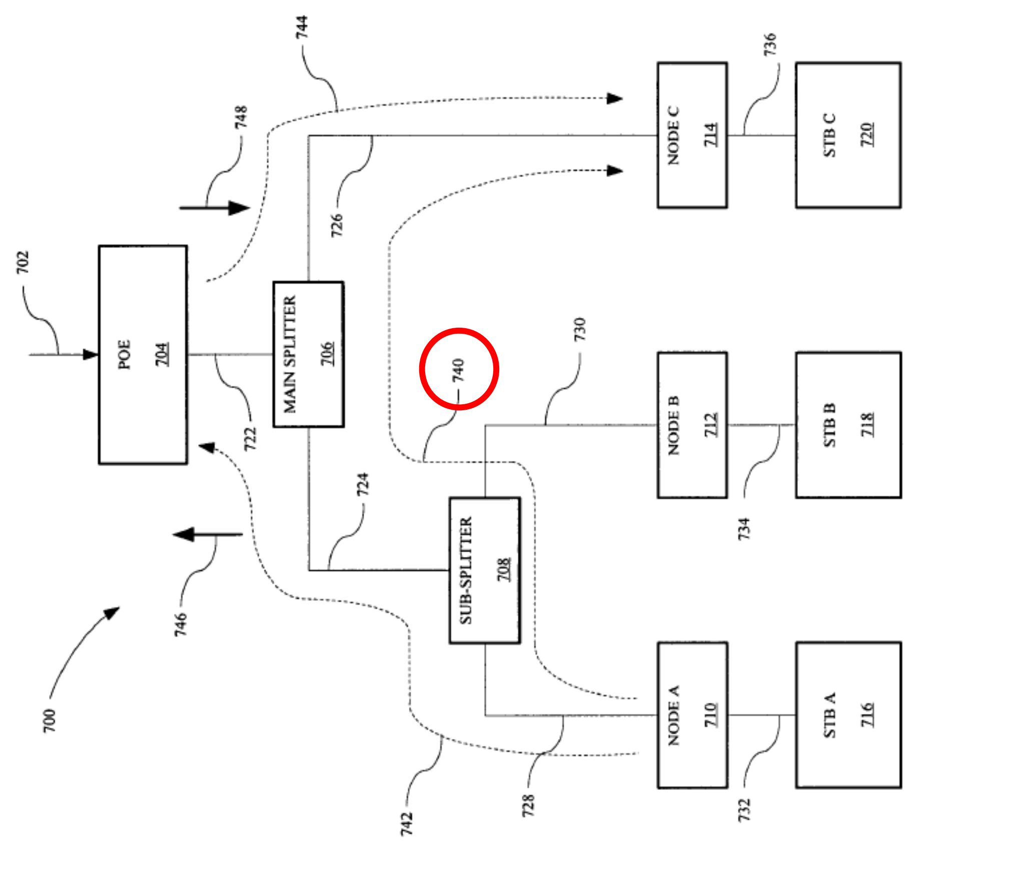


FIG. 7

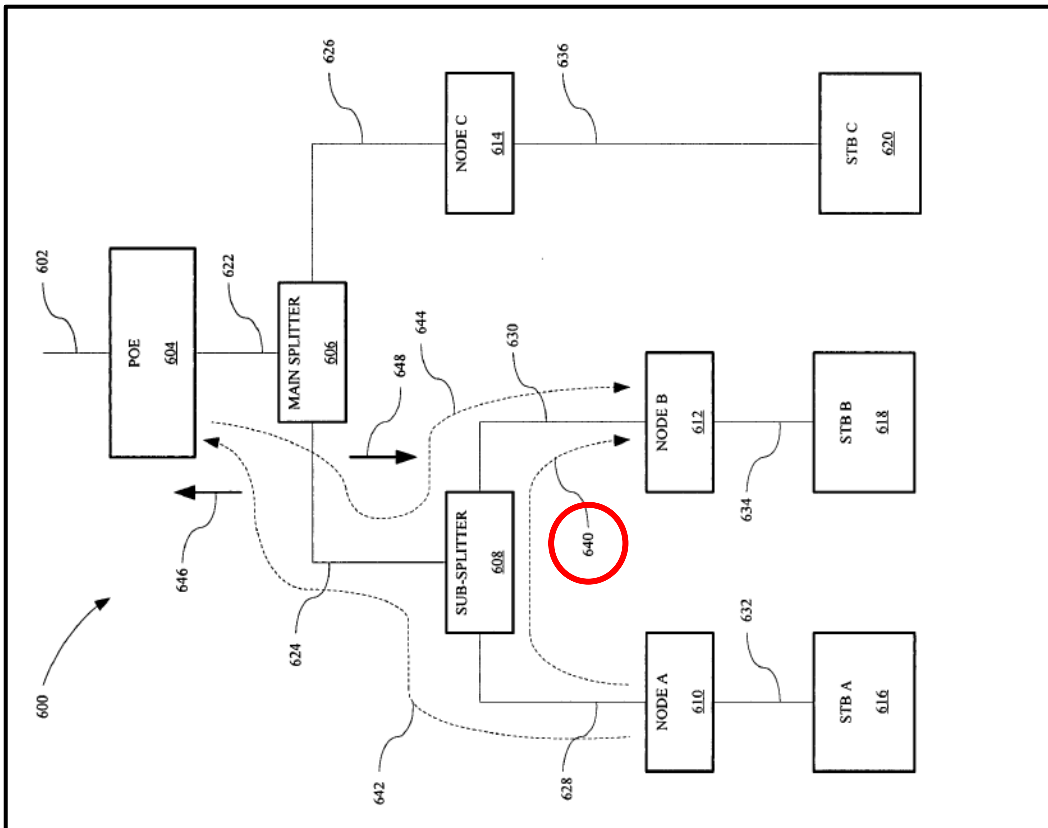


FIG. 6

’759 PATENT, FIGS. 6-7

DISH-1004, ¶43. The different physical attributes of paths 640 and 740, amongst other things, dictate the most-efficient modulation scheme for each path. *Id.*

The ’759 patent uses a common bit-loading modulation scheme to transmit messages from a transmitting node (A above) to receiving nodes (B and C above). The scheme must be common so that each receiving node can understand the transmission. *See* DISH-1001, 10:6-14; DISH-1004, ¶43. Further, at a high level, the transmitting node sends a probe signal, the receiving nodes reply with a modulation scheme, and the transmitting node selects a common scheme from the responses. DISH-1004, ¶¶43-44.

Figures 10A-10C depict bit-loading modulation schemes for communicating between nodes A and B and nodes A and C. *Id.*, 10:15-57; DISH-1004, ¶¶45-50. Figure 10A depicts a plot of the bit-loading constellation size versus carrier-number for the AB channel (path 640), and Figure 10B depicts the same for the AC channel (path 740):

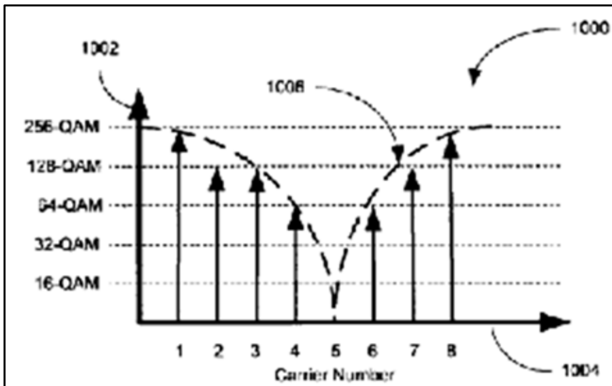
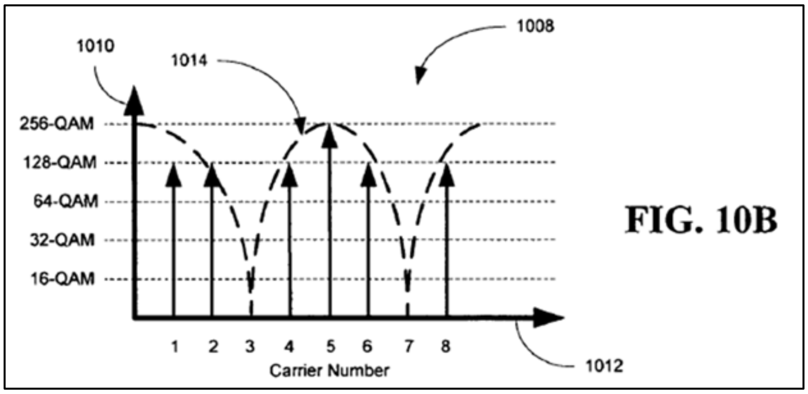
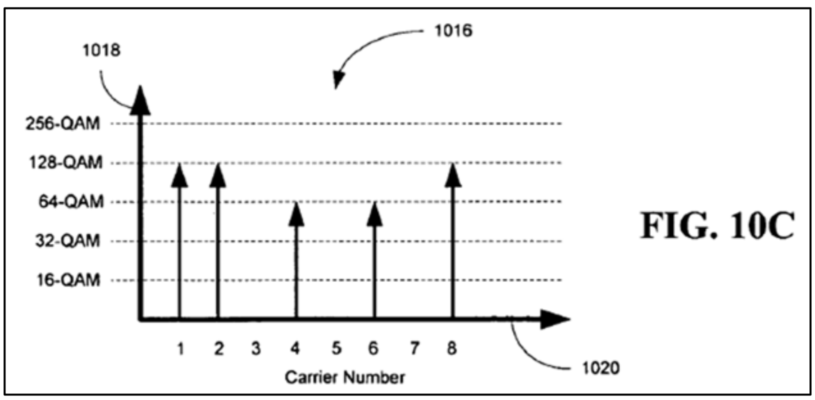


FIG. 10A



’759 PATENT, FIGS. 10A-10B.

Figure 10C shows plots that “graphically represent signals utilizing the common bit-loaded modulation scheme” of “the A-BC channel path between node A and nodes B and C.” *Id.*, 10:43-44, 10:54-56.



’759 PATENT, FIG. 10C.

The “common bit-loaded modulation scheme” is the result of “comparing the carrier number signals from the AB channel in FIG. 10A and the corresponding carrier number signals from the AC channel in FIG. 10B and choosing ***the lowest corresponding modulation value*** for each carrier number.” *Id.*, 10:49-53. Thus, the “common bit-loaded modulation scheme” of Figure 10C uses 128-QAM for

carriers 1, 2, and 8; 64-QAM for carriers 4 and 6; and carriers 3, 5, and 7 are kept OFF. *Id.*, 10:51-54.

B. Prosecution History

The ’759 patent’s underlying application presented 81 claims and claimed priority to eight applications. DISH-1005, 172-193.

The first Office Action rejected 57 claims and objected to 24 others. *Id.*, 90. The Examiner found most claims obvious over Ling (DISH-1006) and Li (DISH-1007). *Id.*, 93. Ling and Li disclose wireless networks that use OFDM/OFDMA. *Id.*; DISH-1004, ¶¶59-60. The Examiner found that Ling discloses most of the claimed elements, including using signal-to-noise ratio (“SNR”) to measure channel characteristics, and that Li discloses selecting common bit-loading modulation schemes based on channel characteristics. DISH-1005, 94-95, 101. The Examiner also found that Gesbert (DISH-1008) discloses using bit-error rate (“BER”) and product-error rate[4] to ascertain channel quality. *Id.*, 100-101.

In response, Applicant cancelled every rejected claim and amended the objected-to claims by incorporating the subject matter of original claim 7. *Id.*, 56-

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[4] Gesbert ¶15 discloses “*packet*-error rate,” (“PER”) which appears in the corrected claims.

57 (claim 7) & 56-76. Original claim 7 corresponds to elements [1i], [1j], [2i], [2j], [3j], and [3k] ***verbatim***.

Applicant, without addressing any prior art, argued that its amendments obviated the rejection. DISH-1005, 76-77.

The Examiner subsequently allowed the claims. *Id.*, 29, 39-53 (no Reasons for Allowance provided). Post-issuance, Applicant corrected five claims by replacing "product error rate" with "*packet* error rate." *Id.*, 21-23.

C. Level of Ordinary Skill

In relation to the '759 patent, a person of ordinary skill in the art ("POSITA") would have a degree in electrical engineering, computer engineering, or a related field and experience working in signal processing and/or communication systems/networks, e.g., a bachelor's and three or more years of experience; a master's and at least one year of experience; or a doctorate and some work experience. DISH-1004, ¶¶24-25. Additional education could substitute for professional experience, or *vice versa*. *Id.*

IV. CLAIMS 1-3 ARE UNPATENTABLE

A. GROUND 1: Carhart in view of Grube

1. Carhart

Carhart, a U.S. patent filed 1997-08-06, qualifies as prior art at least under §102(e). DISH-1009, Cover.

Carhart explains that, in the 1990's, telecommunications companies began using frequency division multiplexing (FDM) to deliver telephone, data, and video services over broadband cable. DISH-1009, 2:4-8, DISH-1004, ¶¶69-77. As these services were introduced, engineers began to use the coaxial cables that were already installed in homes to establish local area networks ("LANs") to connect devices within the home. DISH-1009, 2:24-39. By connecting devices in the home, engineers enabled new in-home, connected multimedia and entertainment experiences. *Id.*, 6:14-27. As Carhart explains, installing new cables in a home was costly, and existing solutions for interconnecting devices were inadequate because they required network modifications. *Id.*, 2:24-3:67.

To address these shortcomings, Carhart developed a network with a centralized computer that uses existing coaxial cables to communicate with remote stations, e.g., televisions and interface devices. *See id.*, Abstract, 1:14-18, 2:24-27, 4:43-49, 7:24-26. To do so, Carhart utilizes a splitter/reflector to direct signals through the cable network, like the '759 patent. *Id.*, Abstract. For example, Carhart's Figure 2 depicts a PC that can communicate with multiple remote devices via a coaxial network. *Id.*, 8:13-22.

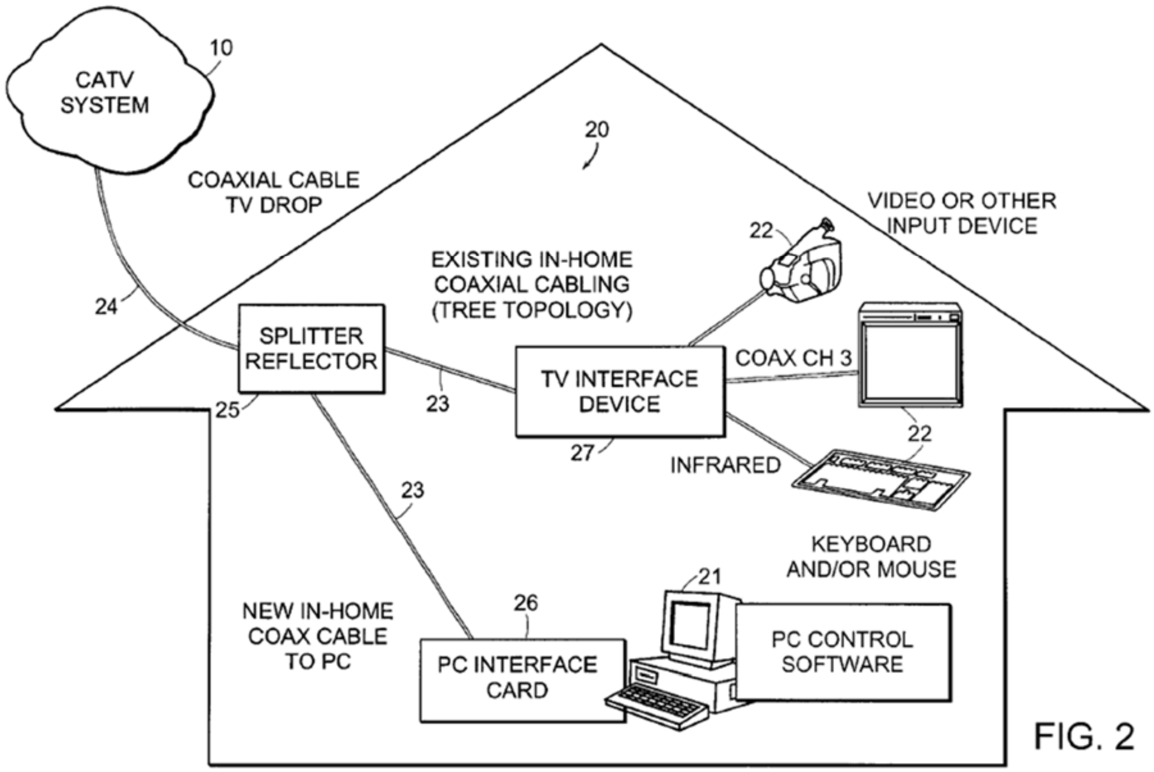


FIG. 2

CARHART, FIG. 2.

Carhart explains that connecting the devices as shown in Figure 2 (and other embodiments) allows the devices to connect to the Internet and realize additional functionality, *e.g.*, multi-player videogaming, without incurring the costs of multiple computers. *Id.*, 2:13-36; 4:43-49, 16:23-40 (Carhart's "central computing apparatus … [avoids] having to provide a computing apparatus at each … site[].") , FIGS. 12A-12F.

2. Grube

Grube, a U.S. patent issued 1996-02-27, qualifies as prior art at least under §102(e). DISH-1010, Cover.

Grube focuses on improving reliability and bandwidth over existing wiring, e.g., telephone lines, to facilitate data transmission without compromising other services. DISH-1010, 2:48-3:17; DISH-1004, ¶¶78-91. To do so, Grube uses FDM with discrete multi-tone ("DMT") modulation to facilitate communication between a primary site and multiple secondary sites. *Id.*, 4:19-26 (explaining that Grube's systems involve "one-to-many and many-to-one communications"), 6:54-67. Specifically, Grube's DMT system uses multicarrier modulation, with quadrature amplitude modulation ("QAM") as the modulation scheme, to ensure a central unit communicates efficiently with multiple subscribers. *See id.*, 3:34-42, 6:54-61, 34:45-52, FIG. 8. Figure 8 depicts a communications system with a primary site (green) connected to secondary sites (red):

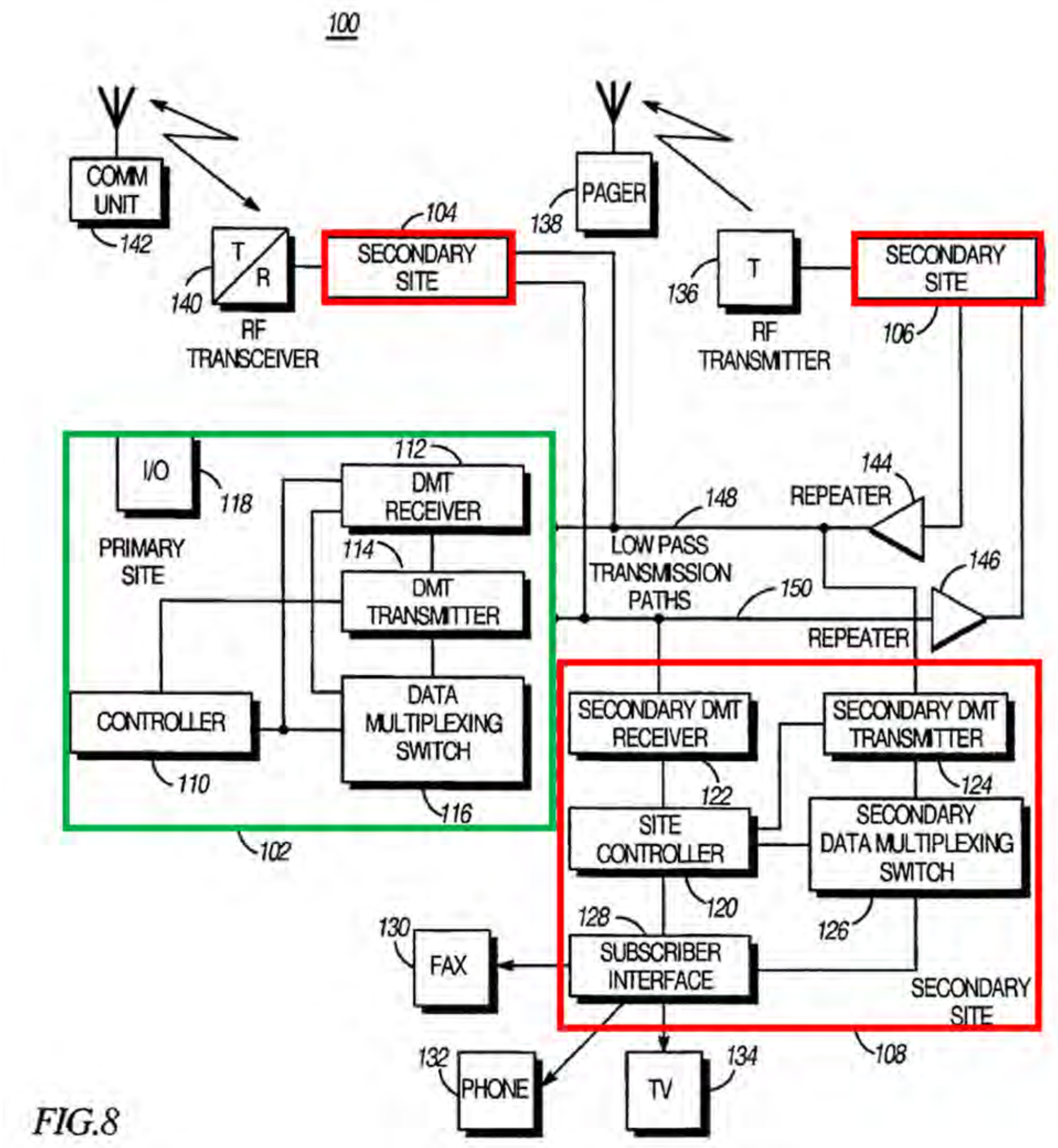


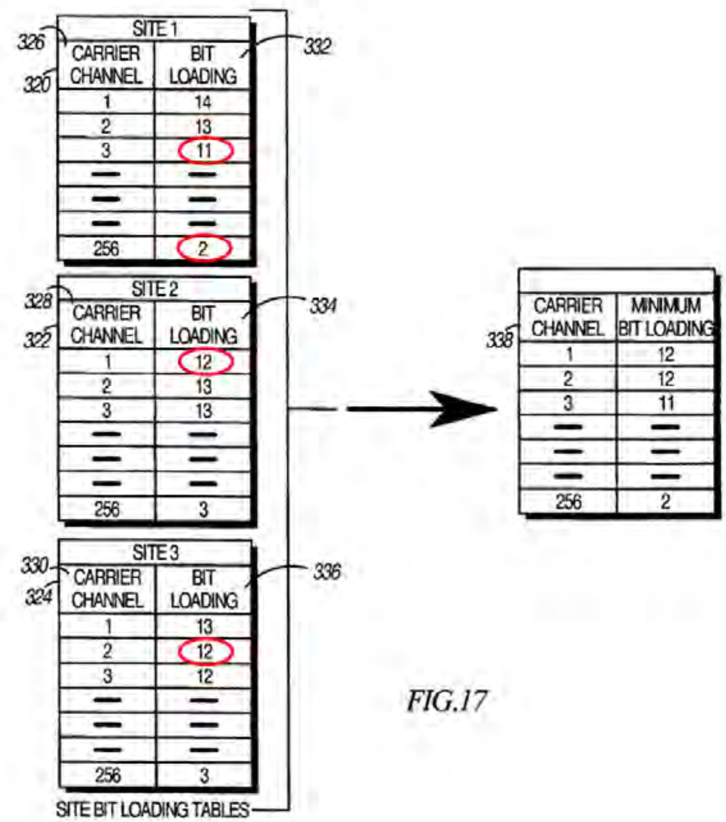
FIG.8

GRUBE, FIG. 8.

Grube ensures that secondary sites in a multi-unit system have enough bandwidth by, among other things, determining a lowest-common-denominator

bit-loading table between each site, and allocating channels based on bandwidth requirements. *Id.*, 14:33-46, 7:13-8:14.

In particular, before transmitting information over the network, "an inbound control channel and an outbound control channel [are] established." *Id.*, 7:13-15. "The outbound control channel for the system infrastructure is generally established when the primary site transmits a training signal to each of the … secondary sites." *Id.*, 7:32-42. "Upon receiving the training signal, each of the secondary sites performs a spectral response analysis of the outbound … transmission path based on the training signal and then creates bit loading information." *Id.* The secondary sites provide this bit-loading information to the primary site, after which "the primary site ***generates a lowest common denominator (LCD) bit loading table*** as a compilation of all of the site bit loading tables." *Id.*, 7:43-50. "From the LCD bit loading table and bandwidth requirements for the outbound control channel, the primary site selects at least one outbound carrier channel … to function as the outbound control channel." *Id.* Grube depicts this process at Figure 17. *Id.*, 18:15-65.



GRUBE, FIG. 17

Specifically, Figure 17 shows that channels 3 and 256 from Site 1, channel 1 from Site 2, and channel 2 from Site 3 were used to generate the LCD bit-loading table (the right column on the right-most table in Figure 17). Grube describes a similar process for establishing the inbound control channel. *Id.*, 7:51-65. After the control channel is established, the system uses the common bit-loading table to facilitate communications. *Id.*, 7:66-8:14.

Grube teaches using this methodology at a variety of "secondary sites," including sites equipped with cable boxes or "any … device that can receive digital

information." *Id.*, 8:28-52, 12:56-13:4, 23:49-60. Simply, Grube is modulating data, and a POSITA would have understood that Grube's modulation techniques are agnostic as to the data content (audio, video, etc.). *Id.*; DISH-1004, ¶88. Further, Grube explains that "a need exists for a … communication system infrastructure that utilizes existing telephone lines while providing the highly reliable service subscribers … expect." DISH-1010, 4:21-26. By using existing wiring, Grube's method avoids new infrastructure expenses. *Id.*, 57:29-38.

3. Motivation to Combine

Carhart presents a base system/network that uses a BCN to facilitate communication between a central unit and multiple remote units. *See* §IV.A.1; DISH-1004, ¶¶92-111.

Similarly, Grube discloses a method for establishing a network with "one-to-many or many-to-one communications" that ensures sufficient bandwidth for reliable communication between multiple sites. DISH-1010, 4:19-26; §IV.A.2. Thus, Grube represents a suitable, known technique for orchestrating digital communication between a central unit and multiple remote units in networks like Carhart's. DISH-1004, ¶93.

A POSITA commencing with Carhart's LAN would have had to decide what communication scheme(s) to use on the network. DISH-1004, ¶94. Carhart explains that the communication paths between devices in the LAN are "capable of

supporting frequency division multiplexing of signals not traditionally used by CATV coaxial cables," and describes components for modulating and demodulating data transmitted through the LAN. *See* DISH-1009, 8:56-9:28, 10:63-11:58, 12:24-13:11, 13:44-14:19. Carhart, however, is agnostic as to the specific modulation scheme(s) to use to ensure reliable communications between devices.

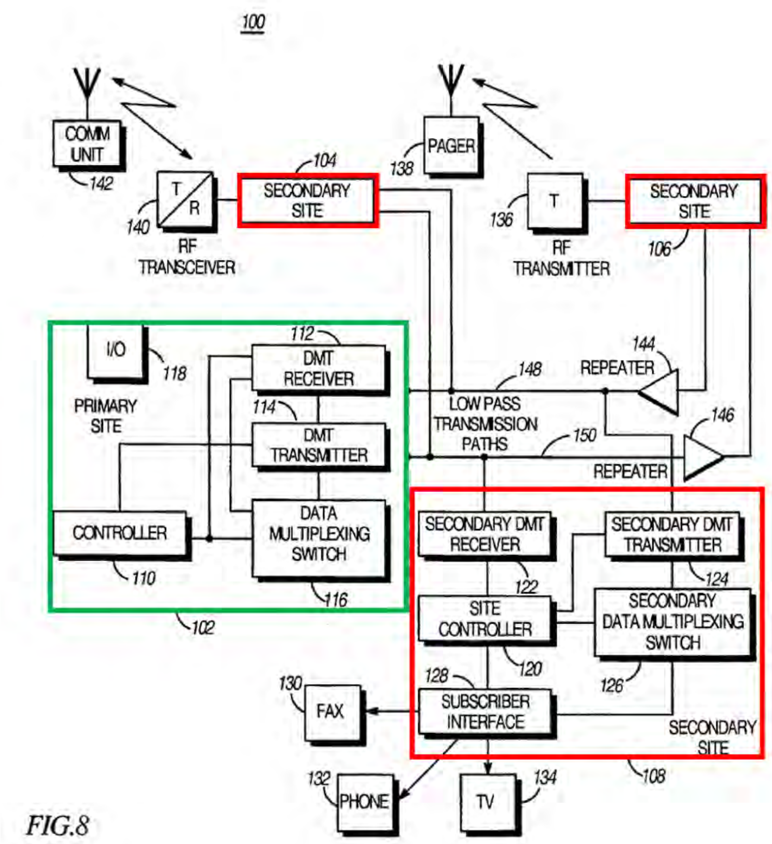
Carhart teaches its LAN connects multiple remote devices, *e.g.*, televisions. DISH-1009, FIG 6. A POSITA would have understood that Carhart's LAN requires high bandwidth, particularly if each remote device uses the network simultaneously. DISH-1009, 16:16-32; DISH-1004, ¶94.

A POSITA would have realized that Grube's DMT modulation scheme addresses both of the noted needs, by providing transmission reliability between Carhart's central computer and remote units and by optimizing communication-channel bandwidth. DISH-1010, 4:21-26; 57:29-38 ("high data rate transmission path requirements are eliminated by the present invention"); DISH-1004, ¶95. Thus, a POSITA would have been motivated to improve Carhart's FDM scheme by implementing Grube's technique. *Id.*

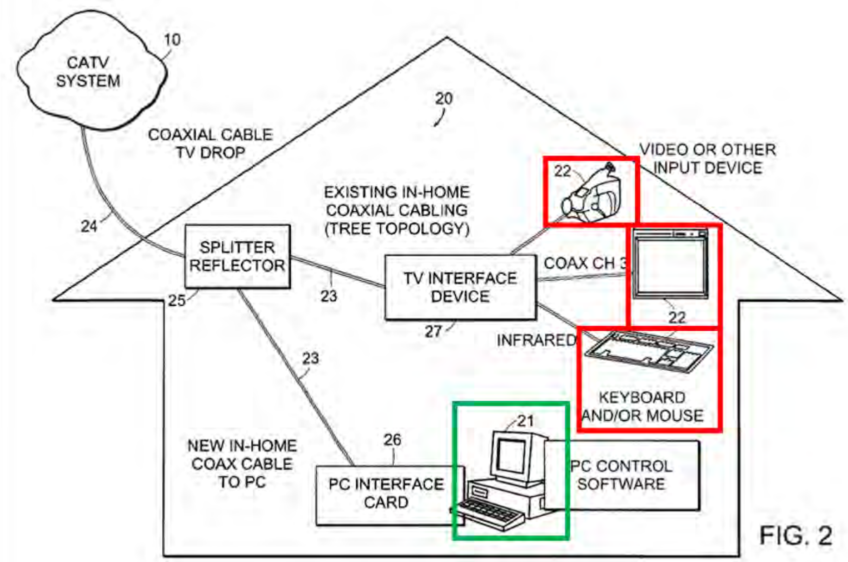
Specifically, a POSITA would have understood that Grube's use of DMT, channel characterization to determine a common bit-loading table, and bandwidth allocation would have ensured reliable and efficient communication between

Carhart's central computer and remote units. DISH-1009, 8:13-55; DISH-1004, ¶96.

Further, a POSITA would have found implementing Grube's method in Carhart's system to be a predictable and routine exercise. DISH-1004, ¶97. In particular, with reference to Grube's FIG. 8 and Carhart's FIG. 2 (shown below), Grube's primary site corresponds to Carhart's centralized computing system (green), and Grube's secondary sites correspond to Carhart's remote units (red):



GRUBE, FIG. 8.



CARHART, FIG. 2.

DISH-1004, ¶97.

Although Carhart focuses on using coaxial cables rather than other common communication media, e.g., telephone wiring and wireless links, a POSITA would have understood that Grube's method would function in Carhart's cables because switching the link medium does not alter Grube's DMT technique. DISH-1004, ¶98. Indeed, a POSITA would have applied Grube's advantageous technique, as it was used for telephony, to Carhart's LAN. *Id.* By employing Grube's process for establishing control channels and allocating bandwidth for data transmissions between nodes, Carhart's LAN would receive the reliability and bandwidth improvements that Grube realizes. *Id.*

Further, a POSITA would have been motivated to employ Carhart's central computer to send "training signals" as taught by Grube, to the plurality of remote units in the LAN. *See* DISH-1009, 8:13-9:28; DISH-1010, 7:13-8:14; DISH-1004, ¶99. Based on the "training signal," Carhart's remote units and/or interface device would determine the channel's characteristics, such as the spectral responses on the channel's carriers. *See* DISH-1010, 7:32-42, 13:45-61, 14:47-58, 15:51-16:10; DISH-1004, ¶99. As Grube acknowledges, measuring such channel characteristics was well-known, at the time, to a POSITA. DISH-1010, 3:43-53; FIG. 5; DISH-1004, ¶99. Using the channel characteristics, Carhart's remote units would each generate bit-loading information, and send it, in a bit-loading table, to the central

computer, just as Grube's network does. *See id.*, 7:32-42, 15:51-16:23; DISH-1004, ¶¶99, 83-84, 107-09 (discussing DISH-1026, DISH-1027, and DISH-1028).

Upon collecting the bit-loading information from the remote units, a POSITA would have been motivated to use Carhart's central computer to perform Grube's process of determining a "lowest common denominator (LCD) bit loading table [from] all of the site bit loading tables." *Id.*, 7:43-50; DISH-1004, ¶100. Thus, a POSITA would have found it straightforward to implement Grube's process for determining an outbound control channel in Carhart's network. DISH-1004, ¶100. Carhart's central and remote units would perform a similar process, per Grube, to determine the inbound control channel and complete network setup. *See* DISH-1004, ¶100; DISH-1010, 7:51-65, 13:62-14:6, 14:24-33.

Thereafter, communications between Carhart's central computer and remote units would have utilized the "inbound and outbound bit loading information to establish an infrastructure for a data transmission," per Grube. *Id.*, 14:34-46; DISH-1004, ¶101. Just as Grube's "primary site retrieves the site bit loading table for each site and generates a lowest common denominator (LCD) call bit loading table for [a] particular call," Carhart's central computer would have utilized the bit-loading tables determined for its LAN to determine a common bit-loading table for transmissions between remote units and/or the central computer. DISH-1010, 7:65-8:14; DISH-1004, ¶101.

Given the straightforward application of Grube's method to Carhart's LAN, a POSITA would have expected the application/combination to yield predictable results. *Id.*; *KSR v. Teleflex*, 550 U.S. 398, 417 (2007) ("if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious[.]"). Moreover, a POSITA would have found implementing Grube's method in Carhart's LAN predictable because it neither renders parts of Carhart's system redundant nor alters Grube's or Carhart's principle of operation. DISH-1004, ¶102. Phrased differently, Grube and Carhart represent known methods, and Grube's method would work in Carhart without a change in their respective functions. *Id.*

Further, Carhart and Grube confront the same problem to be solved: namely, orchestrating data transmission between a central unit and secondary units. *See* DISH-1009, 4:52-5:3, 8:61-65 (noting utility of Carhart's invention on a coaxial or wireless network); DISH-1010, 4:18-26, 6:54-64; DISH-1004, ¶103.[5] This

[5] Carhart, Grube, and the '759 patent are from the same field of endeavor—multiplex communication networking. Carhart and Grube are also reasonably pertinent to the problem the inventors faced—facilitating communication to

commonality, coupled with Grube's optimized one-to-many and many-to-one technique, further demonstrates that a POSITA would have been motivated to apply Grube's technique in Carhart. DISH-1004, ¶103.

Accordingly, a POSITA would have found using Grube's modulation techniques in Carhart's network an obvious choice with a reasonable expectation of success, and a POSITA would have been motivated to pursue that choice given that Grube optimizes communications between central and remote units. DISH-1004, ¶103.

After a POSITA had determined to implement Grube's method in Carhart, the POSITA would have understood that an initial step in implementing Grube's method would be to characterize the transmission paths between Carhart's central computer and remote units. DISH-1004, ¶104. Indeed, Grube's "overall system operation function" logic diagram shows obtaining bit-loading information (steps 230 and 232) as initial steps in the process:

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multiple devices over a BCN—because they concern broadcasting and BCNs. DISH-1004, ¶¶75-77, 90-91; DISH-1001, 1:40-42, 3:62-4:3; DISH-1009, 4:43-57; DISH-1010, 1:6-8, 4:19-26.

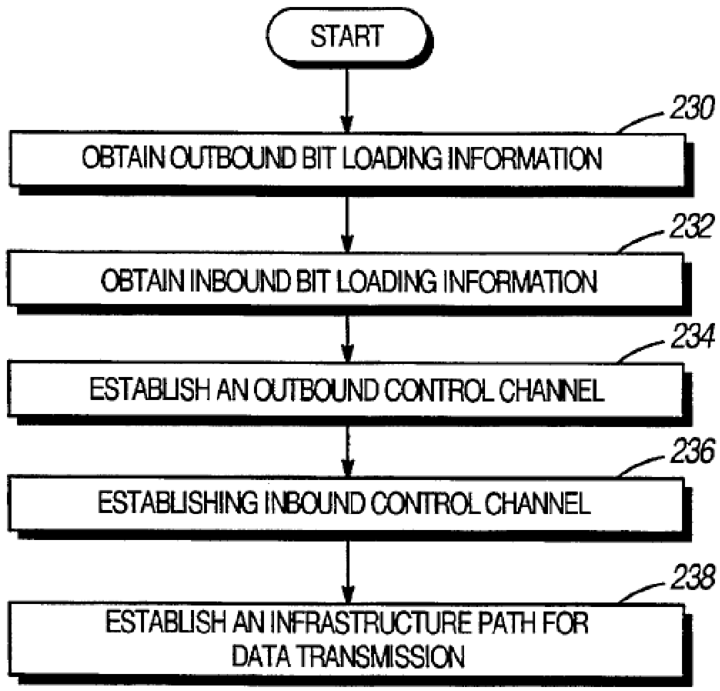

FIG.12

DISH-1010, 13:45-60, 2:62-66 (in ADSL, an initial step is "to establish a spectral response" for the line). In particular, Grube explains that as part of step 230, a training signal is provided, and then the "secondary sites calculate the bit loading information from a spectral response of the output transmission path." *Id.*, 13:45-57. The process repeats for the inbound path. *Id.*, 13:62-14:1.

A POSITA would have understood that Grube's "spectral response" is a measure of how well the path delivers a signal. *Id.*, 15:55-65 ("[T]he secondary site determines the magnitude, and/or phase of the received sinusoidal signal and compares it to the magnitude and phase of the known transmitted sinusoidal signal."); DISH-1004, ¶¶105-09; DISH-1016 (Microsoft) (defining "spectral

response" as "[i]n relation to sensing devices, the relationship between the device's sensitivity and the frequency of the detected energy"). Although Grube and Carhart omit what was well known in the art—the names of particular methods used to characterize the channel's spectral response—such methods would have been well-known to a POSITA. *Id.*

Indeed, the '834 priority-application, which the '759 patent claims priority to, admits that the measurement techniques recited in claims 1-3 were well known. DISH-1004, ¶110. For example, the '834 priority-application explains that measuring a signal, to determine SNR, was a well-known way to determine channel characteristics. DISH-1011, 14 ("[d]etermination of a channel response, multipath, and SNR profile from a known signal is well known in the art."); DISH-1004, ¶36 (Liu discloses using SNR to measure channel quality). The '759 patent's specification drops this admission. *Compare* DISH-1011, 13-16 ("Channel Probing Message" section) *with* DISH-1001 (omitting admission and "Channel Probing Message" section).

If PO asserts additional references are needed to confirm that channel measurement techniques were known, Shibutani, Cai and Flammer evince this background knowledge. *See* §IV.B.1-.2, §IV.C.1. As Dr. Williams explains, each reference discloses well-known techniques for measuring channel characteristics. DISH-1004, ¶¶111, 275-81; DISH-1012, ¶46 (discussing SNR and BER); DISH-

1013, 1:33-50 (using SNR to establish bit-loading); DISH-1014, 3:16-35 (discussing "probability of a bit error," "probability of a packet error" and a "signal strength of the signal at the receiving node."). As Dr. Williams also explains, each reference teaches using channel conditions to optimize data transmission rates. DISH-1004, ¶¶111, 275-81; DISH-1012, ¶46; DISH-1013, 1:33-43; DISH-1014, 2:64-3:5. Thus, Shibutani, Cai, and Flammer confirm what the '834 priority-application admitted was well known, and merely fill in background information. *See Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384 (Fed. Cir. 1986).

4. Claim 1

[1pre]

To the extent the preamble is limiting, the Carhart and Grube combination ("Carhart-Grube") renders obvious [1pre]. DISH-1004, ¶¶112-17.

Carhart discloses using a BCN with a plurality of nodes. DISH-1004, ¶113. For instance, Carhart explains that BCNs have existed for decades. *See* DISH-1009, 1:21-34 (describing a typical coaxial network), 2:40-54, Figs. 1A-1D, 7:20-8:12. As Figure 2 depicts, Carhart's BCN includes coaxial cables 23, which form a BCN. DISH-1009, 8:18-22.

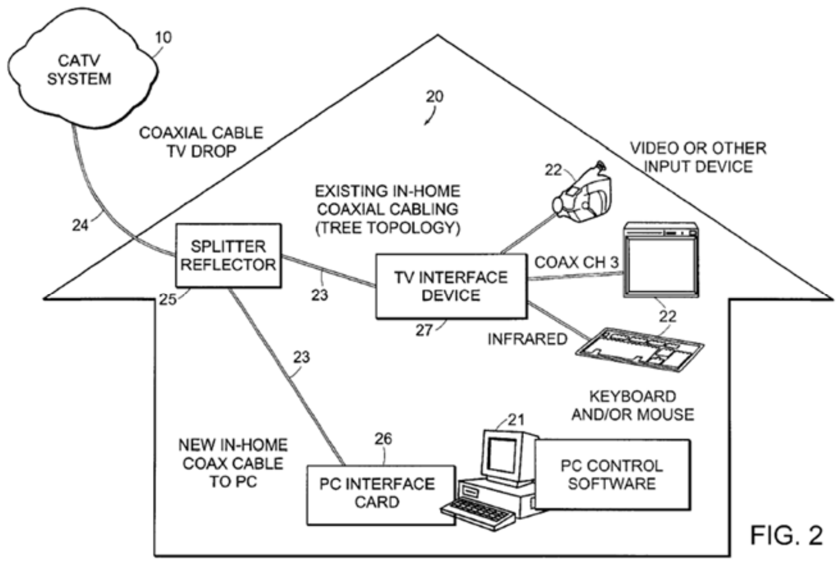

FIG. 2

CARHART, FIG. 2.

Carhart depicts a plurality of nodes—central computing apparatus 21, PC interface card 26, TV interface device 27, and communications stations 22—communicating in the BCN over its various frequency bands. *Id.*, 8:56-9:28 ("frequency band f_1 generally falls … from about 50 MHz to about 550 MHz"), 10:63-11:32 (frequency band f_2 is "greater than about 860 MHz"), 13:44-58, 14:20-37 ("frequency band f_3, selected for user input, is different than frequency band f_2"), Figs. 5-6, 11; DISH-1004, ¶115.

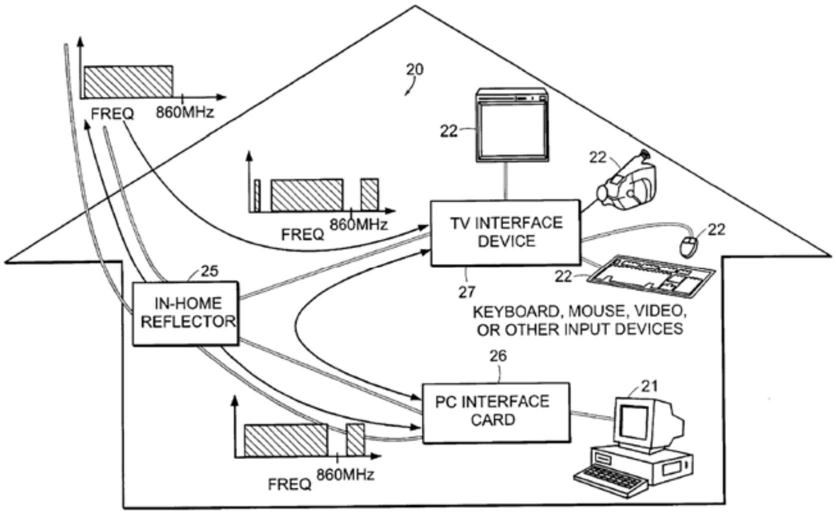

FIG. 6

CARHART, FIG. 6.

Section IV.A.4.[1b], *infra*, addresses the "common bit-loading modulation scheme" aspect of the preamble.

[1a]

In Carhart-Grube, Grube discloses transmitting a training signal, corresponding to element [1a]'s probe signal, from a primary site to a plurality of secondary sites in its network. DISH-1010, 7:32-42; DISH-1004, ¶¶118-123. Grube's secondary sites use the training signals to determine the "spectral response" of the paths between the primary and secondary sites. *Id*. Based on the "spectral response," each secondary site determines a bit-loading table that is provided to the primary site and used to determine a LCD bit loading table for the network. *See* DISH-1010, 7:32-50. Grube Figure 14 presents a flowchart showing

that training signals are transmitted from the primary to secondary sites (step 260), ultimately to determine bit-loading information:

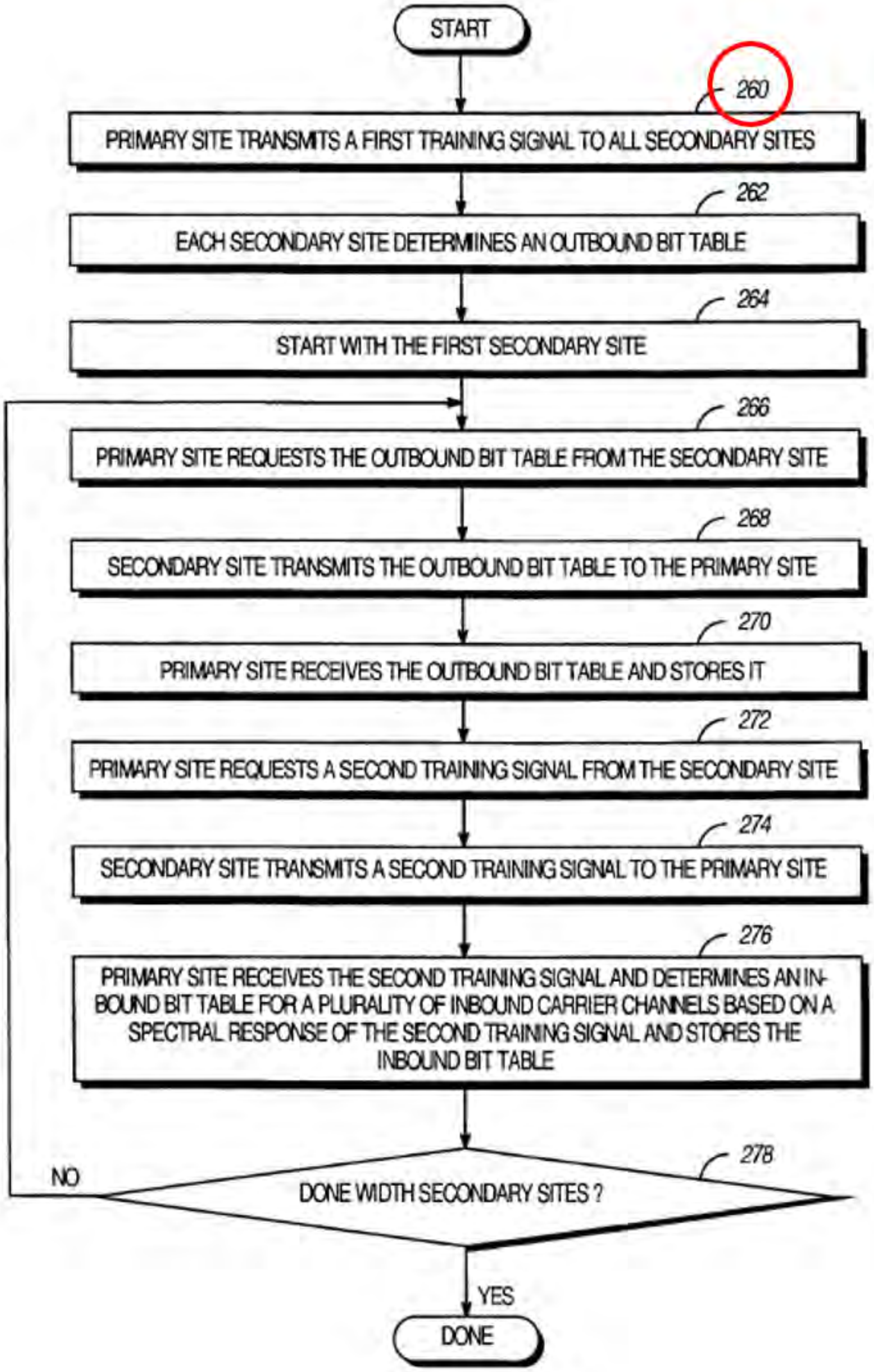

FIG.14

GRUBE, FIG. 14.

Grube explains that these training signals are sent from a primary site to secondary sites (i.e., from a transmitting node to a sub-plurality of receiving nodes). DISH-1010, 15:34-16:10 ("At step 260, the primary site transmits a first training signal to all secondary sites."); DISH-1004, ¶120. Given that Grube's network includes both primary and secondary sites, the secondary sites are a sub-plurality of nodes in the network. DISH-1004, ¶¶120-21.[6] Further, by supplying the training signals to all secondary sites, a POSITA would have understood that the training signals are also sent to a sub-plurality of the receiving nodes. *Id.*

Grube further teaches that the training signals are used to determine a spectral response, and ultimately, a bit-loading table based on the spectral response. *Id.*, 15:38-16:6. Thus, Grube's training signals are used to characterize transmission paths in the network and determine the modulation schemes used on those paths, as Dr. Williams explains in greater detail. DISH-1004, ¶¶122, 83-84, 106-09; *see also* §§IV.A.2-IV.A.3. A POSITA, therefore, would have understood that Grube's "training signal" corresponds to the '759 patent's "probe signal." DISH-1004, ¶122. In particular, the '759 patent's limited description of a "probe

[6] In an alternative embodiment, Grube's system identifies targeted secondary sites associated with subscribers and transmits just to that sub-plurality of targeted secondary sites. *See* DISH-1010, 29:27-53; DISH-1004, ¶121.

signal" indicates that a probe signal is used to "determine[] the transmission characteristics of the channel path" and then "determine[] a bit-loaded modulation scheme for the transmission characteristics of the channel path in step 1110." DISH-1001, 10:58-11:5. As noted above, Grube transmits multiple training signals to secondary sites, for the same purpose of determining transmission path characteristics (e.g., a spectral response) and, in turn, determining a bit-loading modulation scheme.

[1b]

The '759 patent's discussion of response signals, and the role that receiving nodes play in formulating them, is sparse. *See* DISH-1001, 11:15-28. According to the patent, response signals from the receiving nodes merely "inform[] the transmitting node of the corresponding bit-loaded modulation scheme determined by each of the plurality of receiving nodes." *Id.*, 11:21-23. Grube's secondary sites perform this exact function. DISH-1004, ¶¶124-135.

In Carhart-Grube, Grube's primary site receives responses to the training probe that include bit-loading information, which corresponds to element [1b]'s bit-loading modulation scheme. DISH-1010, 7:32-42, 13:45-61, 16:11-23; DISH-1004, ¶125. After Grube's primary site sends a training signal, the secondary sites generate bit-loading information and send that information to the primary site via a plurality of response signals. *Id.* For example, Grube Figure 14, below,

"illustrates a logic diagram that the primary site may utilize to determine the inbound bit loading information and the outbound bit loading information." *Id.*, 15:34-36.

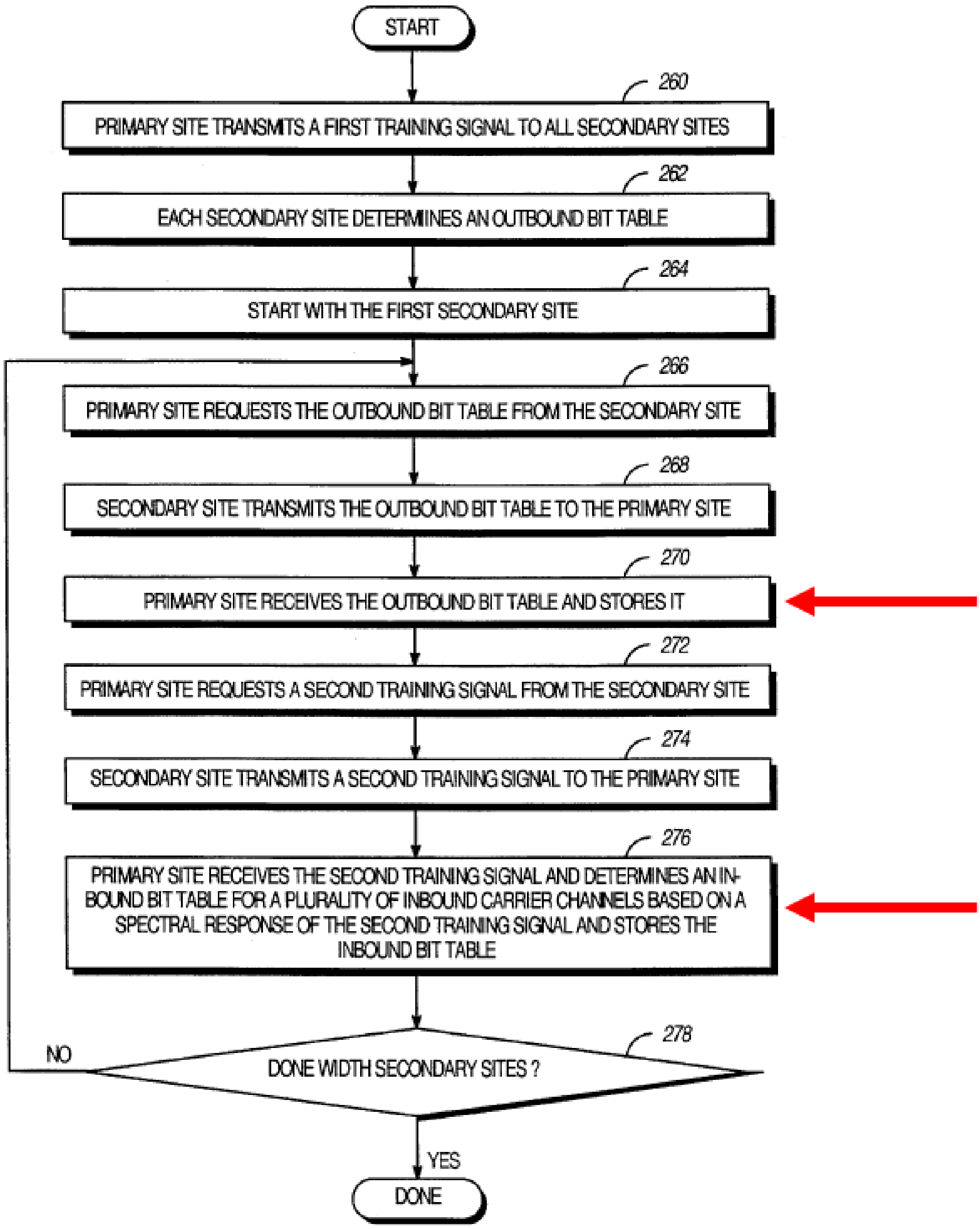
START
260
PRIMARY SITE TRANSMITS A FIRST TRAINING SIGNAL TO ALL SECONDARY SITES
262
EACH SECONDARY SITE DETERMINES AN OUTBOUND BIT TABLE
264
START WITH THE FIRST SECONDARY SITE
266
PRIMARY SITE REQUESTS THE OUTBOUND BIT TABLE FROM THE SECONDARY SITE
268
SECONDARY SITE TRANSMITS THE OUTBOUND BIT TABLE TO THE PRIMARY SITE
270
PRIMARY SITE RECEIVES THE OUTBOUND BIT TABLE AND STORES IT
272
PRIMARY SITE REQUESTS A SECOND TRAINING SIGNAL FROM THE SECONDARY SITE
274
SECONDARY SITE TRANSMITS A SECOND TRAINING SIGNAL TO THE PRIMARY SITE
276
PRIMARY SITE RECEIVES THE SECOND TRAINING SIGNAL AND DETERMINES AN IN-BOUND BIT TABLE FOR A PLURALITY OF INBOUND CARRIER CHANNELS BASED ON A SPECTRAL RESPONSE OF THE SECOND TRAINING SIGNAL AND STORES THE INBOUND BIT TABLE
278
NO
DONE WIDTH SECONDARY SITES ?
YES
DONE

FIG.14

In discussing steps 264-274, Grube explains that the secondary sites send response signals including bit-loading information, namely the bit-loading table. *Id.*, 16:11-34 ("[T]he primary site sends a request message to the secondary site [and] … the secondary site responds with its bit loading table."). Because each secondary site provides a response signal to the primary site, a POSITA would have understood that the primary site receives response signals from a sub-plurality of nodes. DISH-1004, ¶126.

For each response signal, a secondary site determines the bit-loading for each carrier channel it utilizes to communicate with the primary site and includes the determined bit-loading information in its response. *Id.*, 15:60-16:17 ("the secondary site can then calculate the bit loading"). A POSITA would have understood that Grube's bit-loading tables, and the corresponding discussion in the specification, to disclose a constellation encoding scheme (i.e., a "bit-loading modulation scheme"). *Id.*, 3:51-53 ("The bit loading table includes, for each carrier channel, a number of bits that the carrier channel can support."); 25:17-49; DISH-1004, ¶¶127-29. For example, Grube Figures 15 and 17 depict exemplary bit-loading tables received from multiple secondary sites. For each carrier, the secondary site determines a bit-loading field indicating "a number of bits that the carrier channel can support." DISH-1010, 3:51-53; DISH-1004, ¶127.

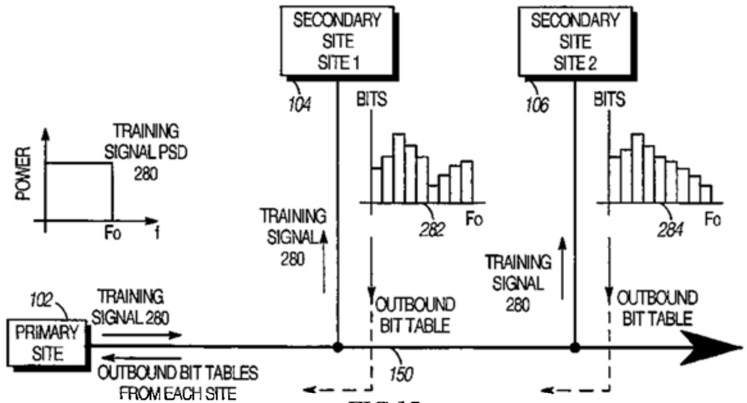

FIG.15

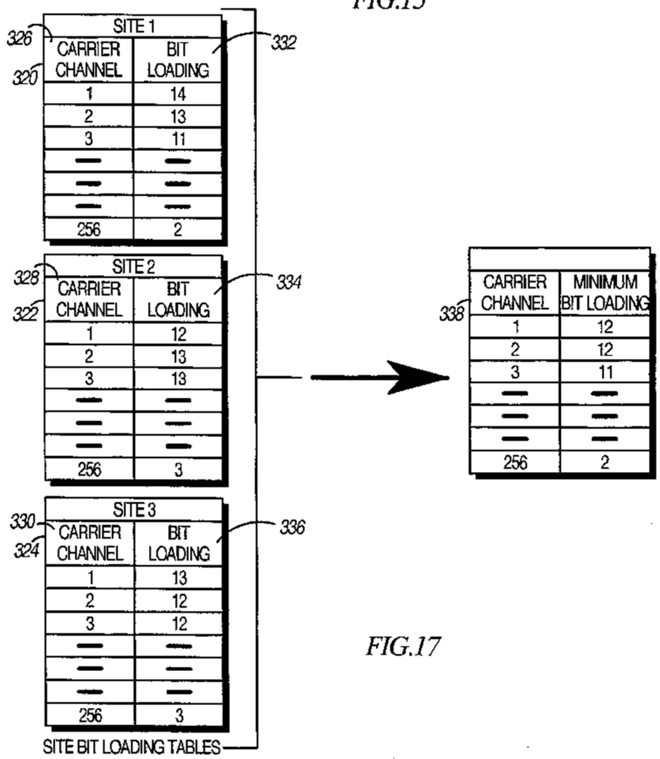

FIG.17

GRUBE, FIGS. 15, 17.

A POSITA would have understood that Grube's bit-loading tables and corresponding discussion in the specification (e.g., that Grube only discloses QAM modulation schemes) to disclose a "bit-loading modulation scheme" that is compatible with the channel between that secondary site and primary site. DISH-

1004, ¶¶127-31.[7] And, like the '759 patent, Grube discloses that it uses QAM as the modulation scheme. *Id.*, DISH-1010, 3:34-42, 34:45-52, 51:43-52:6, FIG. 51 (showing a 16-QAM constellation diagram). Specifically, a POSITA would have understood that the bit-loading information associated with each carrier in Grube's bit-loading table indicates both the "number of bits that the carrier channel can support" (DISH-1010, 3:51-53) and "the number of constellation points" available to the carrier (*id.*, 51:51-54). Grube explains that the relationship between the number of bits supported by a carrier (*n*) and the modulation constellation size (*x*) is x-QAM = 2^n. DISH-1010, 51:54-57. Dr. Williams explains that in a QAM system the number of constellation points for a carrier discloses the "bit-loading modulation scheme" for that carrier because each modulation scheme has a corresponding number of constellation points, e.g., 4-QAM has 4 constellation points, 16-QAM has 16 constellation points, and so on. DISH-1004, ¶¶127-29. The '759 patent itself acknowledges the correspondence between the number of constellation points and the modulation scheme by referring to the modulation scheme as "constellation size." DISH-1001, 10:15-57.

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[7] If PO argues that Grube does not disclose "includ[ing] a bit-loading modulation scheme," a POSITA would have found using QAM obvious. DISH-1004, ¶¶28-30, 130-133.

Thus, in Carhart-Grube, to the extent Grube does not explicitly disclose a "bit-loading modulation scheme," a POSITA would have understood that Grube discloses a "bit-loading modulation scheme." DISH-1004, ¶¶124-31.

To the extent PO might argue that Grube does not disclose the claimed "bit-loading modulation scheme," a POSITA would have understood such a "scheme" to have been obvious over Grube-Carhart. For example, a POSITA would have understood that including a modulation scheme in Grube-Carhart would allow for the system to maximize efficiency in signal transmissions by allocating modulation schemes to carrier channels based on bit-loading capabilities. Doing so would enhance signal strength and improve the reception quality of signals transmitted on those channels, particularly those transmitted over long distances. DISH-1004, ¶132.

A POSITA would have also experienced a reasonable expectation of success in implementing a "bit-loading modulation scheme" in Grube-Carhart. As discussed, Grube already disclosed determining "bit loading information" for each carrier channel, which a POSITA would have understood to disclose a QAM constellation scheme. Thus, a POSITA would have understood this to be the combination of prior art elements (modulation scheme; Grube-Carhart's communication system with bit-loading capabilities) according to known methods (implementing a modulation scheme in such a communication system) to yield

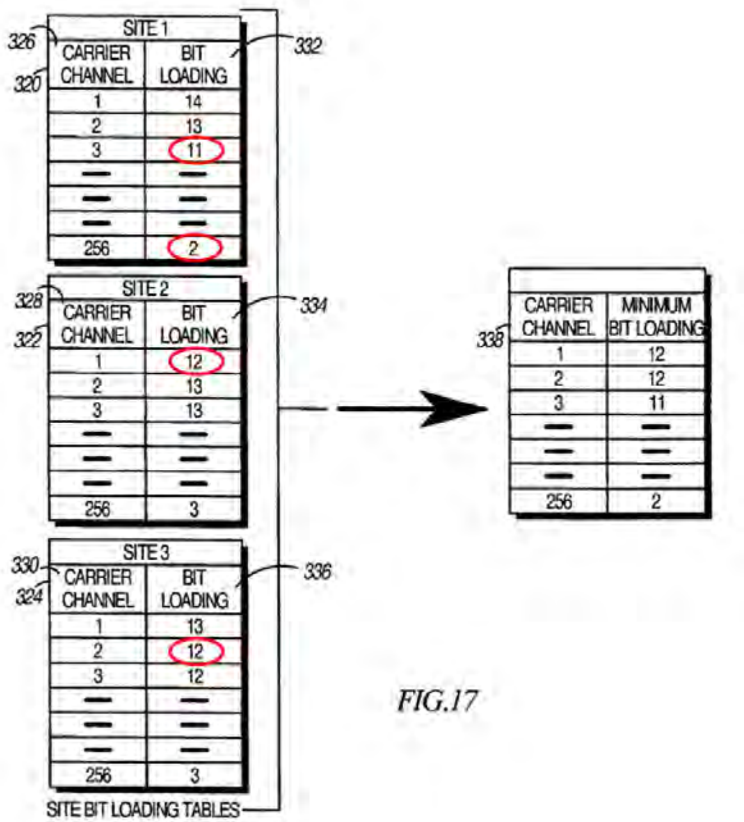
predictable results (a communication system with a modulation scheme to regulate signal transmissions). DISH-1004, ¶133.

[1c]

The ’759 patent describes “common bit loading” schemes in relation to Figure 10C, which explains that the “carrier number signal values [shown in FIG. 10C] are the result of comparing the carrier number signals from the AB channel in FIG. 10A and the corresponding carrier number signals from the AC channel in FIG. 10B and ***choosing the lowest corresponding modulation value*** for each carrier number.” DISH-1001, 10:49-53, 6:65-7:5. As discussed below, Grube discloses this approach—choosing the lower of two values—to determine a common bit-loading scheme.

In Carhart-Grube, Grube discloses or renders obvious determining a common bit-loading scheme for communicating between its plurality of sites from the bit-loading information responses transmitted by the secondary sites. DISH-1010, 7:32-50; 18:16-65; DISH-1004, ¶¶136-41. Specifically, Grube determines a common bit-loading scheme by comparing the bit-loading information, on a channel-by-channel basis, received from each secondary site. DISH-1010,18:24-42. The “common” scheme is determined by selecting the lowest bit-loading value reported for each channel and combining those bit-loading values into a single

common bit-loading table. *Id.*, 7:42-50; 18:43-55; DISH-1004, ¶¶137-38. Figure 17 depicts this process:



GRUBE, FIG. 17

As shown, the lowest bit-loading value for each channel from the bit-loading tables on the left (red) are combined into the "outbound control channel bit loading table" on the right. Grube uses the same process for outbound and inbound bit-loading schemes. *Compare* DISH-1010, 18:16-65 (establishing an outbound control channel) *with id.*, 19:55-31 (establishing an inbound control channel), 7:66-8:14 ("[T]he primary site retrieves the site bit loading table for each target site and

generates a lowest common denominator (LCD) call bit loading table for this particular call.”). Further, Grube explains that when updating a common bit-loading table (e.g., “outbound control channel bit loading table 338”), the lowest bit-loading value for each channel should be used. *Id.*, 36:29-46. Grube consistently teaches utilizing the “lowest common denominator (LCD) bit loading table as a compilation of all of the site bit loading tables.” *See id.*, 8:5-11, 14:11-15, 21:53-58; DISH-1004, ¶¶138-39. As Dr. Williams explains, the “number of bits that the carrier channel can support” is the base-2 exponent for the QAM order for each carrier. DISH-1010, 3:51-53, Fig. 51 (showing QAM constellations); DISH-1004, ¶¶106, 127-29, 138-41. In Figure 17, for instance, carrier channel 256 has a LCD bit-loading of two bits, such that carrier channel 256 would use a 4-QAM order (2^2=4). DISH-1004, ¶138.

Thus, a POSITA would have understood that Grube discloses “determining the common bit-loading modulation scheme from the received plurality of response signals.” DISH-1004, ¶¶139-141.

To the extent one might argue that Grube does not disclose performing operations on a “bit-loading modulation scheme,” a POSITA would have understood that it would have been obvious to include such a “scheme” in Grube-Carhart as discussed above. *See* §IV.A.4.[1b]; DISH-1004, ¶140.

[1d]

In Carhart-Grube, Grube discloses that its secondary sites (i.e., receiving nodes) each receive a training signal (i.e., a probe signal) through a channel (i.e., a "channel path of transmission") that includes carriers. *See* §IV.A.4.[1b]; DISH-1010, 16:11-50; DISH-1004, ¶¶142-44. For the reasons discussed for element [1b], Carhart-Grube renders obvious element [1d].

[1e]

In Carhart-Grube, Grube discloses that its secondary sites each determine the transmission characteristics of a transmission path. DISH-1004, ¶146. Specifically, Grube explains that a secondary site determines for each carrier a spectral response, one type of a transmission characteristic, by comparing a received signal against the known magnitude and phase of the signal that was sent on that carrier. DISH-1010, 3:43-53, 7:32-41, 15:51-16:10, FIG. 5. The observed spectral response is then used to determine how many bits each carrier can handle. *Id.*, 15:65-16:1, 16:61-17:4.[8] The spectral response of the carriers in a transmission

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[8] If PO argues that [1e] requires determining multiple "transmission characteristics," the references identified in this Petition disclose determining multiple "transmission characteristics" beyond Grube's spectral response, including at least SNR, BER, and PER. DISH-1004, ¶147.

path includes the response of each carrier in that path (transmission characteristic). *Id.* The transmission characteristics of the carriers in sum are the "transmission characteristics of the channel path." DISH-1004, ¶146.

[1f]

As explained under element [1b], in Carhart-Grube, Grube's secondary sites transmit a response signal to the primary site. *See* §IV.A.4.[1b]; DISH-1010, 16:11-38 ("[T]he primary site sends a request message to the secondary site wherein … the secondary site responds [to the primary site] with its bit loading table."); DISH-1004, ¶¶149-51.

[1g]

In Carhart-Grube, Grube discloses determining a spectral response (i.e., transmission characteristics) of a training signal (i.e., probe signal) at a secondary site, and renders obvious measuring the SNR of the training signal in order to determine that spectral response. DISH-1004, ¶¶152-63.

Specifically, a POSITA would have understood SNR as one of a number of measurable spectral responses of the training signal, as shown by Shibutani (and/or

Cai and Heath). DISH-1010, 15:51-16:50; DISH-1012, ¶46; DISH-1013, 1:12-2:21; DISH-1004, ¶¶153, 207, 275-91.[9]

As explained above, Grube's secondary sites receive a training signal from the primary site. *See* §IV.A.4.[1a]; DISH-1010, 15:51-53. The secondary site measures a spectral response of the received training signal by comparing the magnitude and/or phase of the received signal to the magnitude and/or phase of a known signal in each carrier. *Id.*, 15:51-16:10. The secondary site then calculates the bit-loading information for each carrier in the channel. *Id.* Grube notes that carriers with better transmission characteristics can support higher bit-loading. *Id.*, 16:61-17:4. Thus, Grube measures the magnitude and/or phase of a received probe signal to determine the channel path's "transmission characteristics." DISH-1010, 15:51-16:10; DISH-1004, ¶156.

Although Grube determines its bit-loading tables based on a spectral response to a training signal, Grube does not limit/define the metrics that may be used to determine the transmission characteristics. DISH-1004, ¶157. Indeed, a

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[9] SNR refers to the signal strength relative to interference (background noise). DISH-1004, ¶154; DISH-1015; DISH-1017 (SNR is "[t]he ratio of the usable signal being transmitted to the noise or undesired signal"); DISH-1018 (defining SNR).

POSITA would have known that numerous metrics for measuring transmission characteristics were known at the time, and that any one metric would be adequate to determine Grube's bit-loading table. *See* DISH-1011, 14 (using SNR was "well known in the art."); DISH-1004, ¶¶157-59, 83-84, 107-09. Because these metrics are well known, a POSITA would have been able to choose a suitable metric and use it to determine transmission characteristics. *Id.*; *KSR*, 550 U.S. at 421; *Uber Techs. v. X One, Inc.*, 957 F.3d 1334, 1341 (Fed. Cir. 2020) (finding claims obvious where there the prior art presented a "simple design choice" between two solutions).

A POSITA's understanding that SNR, BER, and PER are "transmission characteristics" was also reflected during prosecution. DISH-1004, ¶160. For example, the Examiner found that Ling and Gesbert disclosed measuring SNR, BER, and PER to determine transmission characteristics, and rejected all claims directed to these concepts. *See* DISH-1005, 101-02 (applying DISH-1006 and DISH-1008, ¶¶13-15, 18). Rather than contest these findings, the Applicant canceled claims directed solely to SNR, BER, and PER and incorporated those limitations into other claims. DISH-1005, 55-78.

Other prior art shows using SNR to determine transmission characteristics during network training was known. Shibutani discloses several well-known metrics that a POSITA would use to determine transmission characteristics.

DISH-1012, ¶46; DISH-1004, ¶161. Specifically, Shibutani discloses sending "pilot symbols"—which correspond to the '759 patent's "probe" signals and Grube's "training" signals—to a channel condition detector that "measures a channel condition … based on the received the pilot symbol." *Id.* Shibutani adds that "[t]hose skilled in the art will appreciate that the channel condition detector 157 may measure other channel condition indicators, [including] signal to noise ratio (SNR)." *Id.*

As with Grube's spectral-response determination, Shibutani's access terminals (ATs), which correspond to Grube's secondary sites and the '759 patent's receiving nodes, send the "channel condition information" to an access point (AP), which correspond to Grube's primary site and the '759 patent's transmitting node. *Id*; DISH-1004, ¶162. Shibutani's system uses the channel condition to determine a data rate for the AT, which involves selecting a modulation scheme. DISH-1012, ¶46 (Table 2 depicts modulation schemes). Thus, Shibutani utilizes the same techniques as Grube and the '759 patent, but also adds specific metrics for determining a channel path's transmission characteristics.

Similar to Shibutani, Cai explains that in conventional DMT systems, SNR is measured to determine optimal bit-loading for each channel. DISH-1013, 1:33-43, 2:62-3:3; DISH-1004, ¶¶275-79. Thus, as a foundational matter, Cai shows that using SNR to configure bit-loading was "conventional." *Id.*; DISH-1013,

1:33-36 ("conventional DMT modems establish a bit loading configuration in which the bit rate of individual channels varies based upon the signal-to-noise ratio of each channel"), 2:14-21, 4:23-43.

Further, the '834 priority-application admits that determining transmission characteristics by measuring SNR was well known in the art. *See* §IV.A.3; DISH-1004, ¶163.

Based on Carhart and Grube's teachings, it therefore would have been obvious to a POSITA to determine the transmission characteristics by measuring SNR.

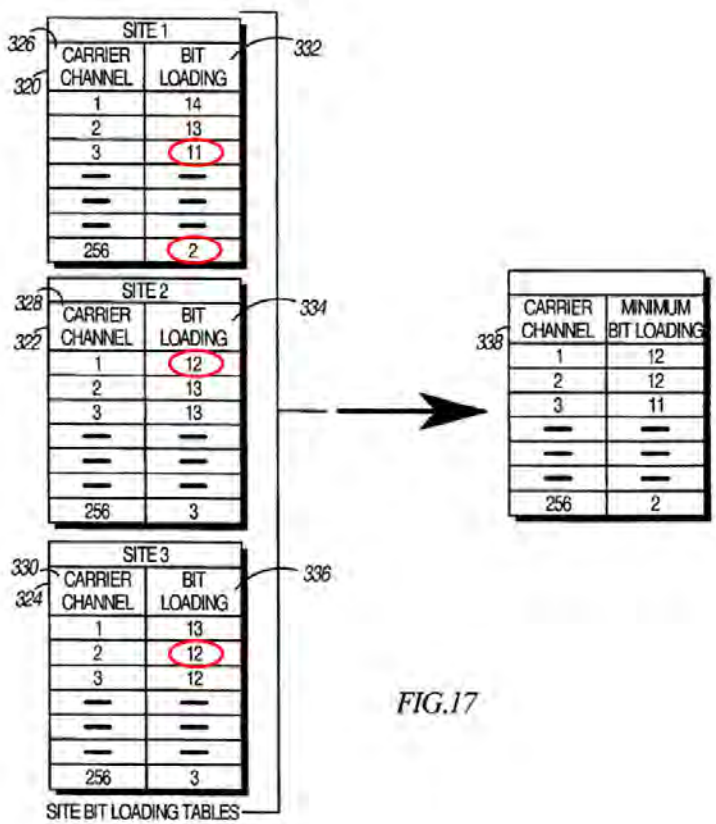
[1h]

As noted above, Carhart-Grube discloses/renders obvious "***determining a common bit-loading modulation scheme***." *See* §IV.A.4.[1c]. Implementations of this determination in Carhart-Grube are described in more detail below with respect to elements [1i] and [1j]. DISH-1004, ¶¶165-67.

[1i]

As discussed above, Grube's primary site receives a plurality of bit-loading information from its secondary sites. *See* §IV.A.4.[1b]; DISH-1010, 18:16-65; DISH-1004, ¶¶168-72. Grube's primary site then compares the bit-loading information received from the secondary sites. DISH-1010, 18:24-26 ("The outbound control channel bit loading table 338 is generated ***by comparing*** the bit

loading, on a [carrier] channel by [carrier] channel basis, of all of the site bit loading tables."). Figure 17 depicts comparing bit-loading information from secondary sites. As shown, Grube's method compares the values from the bit-loading tables from the secondary sites (left)—the large arrow in the middle of the figure depicts the comparison—and the results of the comparison are incorporated into the "outbound control channel bit-loading table 338" (right):



GRUBE, FIG. 17.

As explained for element [1b], the bit-loading tables and specification disclose a QAM scheme. *Id.*, 3:51-53, 25:17-49; DISH-1004, ¶¶127-29, 170.

Specifically, the bit-loading of each carrier indicates the "number of bits that the carrier channel can support," which corresponds to a compatible QAM order for that carrier. *Id.*, DISH-1010, 3:51-53.

To the extent one might argue that Grube does not disclose performing operations on a "bit-loading modulation scheme," a POSITA would have understood that it would have been obvious to include such a "scheme" in Grube-Carhart as discussed previously. *See* §IV.A.4.[1b]; DISH-1004, ¶171.

[1j]

Element [1j] merely reiterates, with extremely minor differences in syntax, the substantive concepts in elements [1b], [1c], and [1i].

As discussed above, the '759 patent uses the same approach Grube discloses—choosing the "lessor" of two values—to determine a common bit-loading modulation scheme. *Compare* DISH-1010, 3:51-53, 25:17-49 and DISH-1004, ¶¶175-78; *with* DISH-1001, 10:49-53; §IV.A.4.[1b], [1c], and [1i].

Grube's primary site determines the common bit-loading modulation scheme by comparing the schemes each channel can use and selecting the lowest common

scheme that all secondary sites can use.[10] *Id.*; DISH-1010, 18:16-65, FIG. 17; DISH-1004, ¶175;

Grube's bit-loading tables and specification disclose a QAM scheme. DISH-1010, 3:51-53, 25:17-49; DISH-1004, ¶¶127-129, 178; DISH-1014; §IV.A.4.[1b]. Specifically, the bit-loading of each channel indicates the "number of bits that the carrier channel can support," which corresponds to a compatible QAM order for that channel. *Id.*

Thus, Grube discloses the same approach the '759 patent claims. DISH-1004, ¶¶178-79.

To the extent one might argue Grube does not disclose performing operations on a "bit-loading modulation scheme," a POSITA would have understood that it would have been obvious to include such a "scheme" in Grube-Carhart. *See* §IV.A.4.[1b]; DISH-1004, ¶180.

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[10] Put differently, Grube selects the fastest scheme that all the secondary sites can use on a given channel—and such a scheme is dictated by the secondary site with the lowest bit-loading value. DISH-1004, ¶175.

5. Claim 2

[2pre]-[2e]

Elements [2pre]-[2e] are verbatim copies of elements [1pre]-[1e]. Neither the additional elements of claim 2, nor any other claim, impart any substantive nuance upon elements [2pre]-[2e]. Thus, Carhart-Grube renders obvious elements [2pre]-[2e] for the reasons provided above. *See* §IV.A.4.[1pre]-[1e]; DISH-1004, ¶¶183-85.

[2f]

The first phrase in element [2f]—"transmitting a response signal from the one receiving node to the transmitting node"—is a verbatim copy of element [1f]. Neither the additional elements of claim 2, nor any other claim, impart any substantive nuance upon this phrase. Thus, in Carhart-Grube, Grube discloses this aspect of element [2f] for the reasons provided above. *See* §IV.A.4.[1f]; DISH-1004, ¶187.

The remainder of element [2f] differs from element [1g] only in that element [2f] measures BER rather than SNR.[11] DISH-1004, ¶188. However, BER, like

[11] BER refers to the total number bits received in error in relation to the total number of bits transmitted. DISH-1004, ¶188; DISH-1017 (BER is "[t]he

SNR, was well-known in the art, such that measuring BER to determine the characteristics of the transmission path represents a simple choice between well-known techniques. *Id.*; *KSR*, 550 U.S. at 418-19.

For instance, during prosecution, the Examiner found that Ling and Gesbert disclose using SNR, BER, and PER to measure the transmission characteristics of the channel; the Examiner rejected all claims directed to these concepts. *See* DISH-1005, 101-02; DISH-1006; DISH-1008; DISH-1004, ¶189. Likewise, Shibutani discloses several metrics for measuring channel quality (i.e., "transmission characteristics of the channel path") that would have been well known to a POSITA, including BER. *See* §IV.A.4.[1g]; DISH-1012, ¶46 ("an error rate, such as … ***b[i]t error rate (BER)***, may be used as channel condition information"), ¶64. Similar to element [1g], Shibutani's discussion of BER uses the same basic technique Grube and the '759 patent describe—measuring channel condition to ensure service quality—and describes BER as one of a finite number of suitable measurement techniques for measuring the channel condition. DISH-1004, ¶189.

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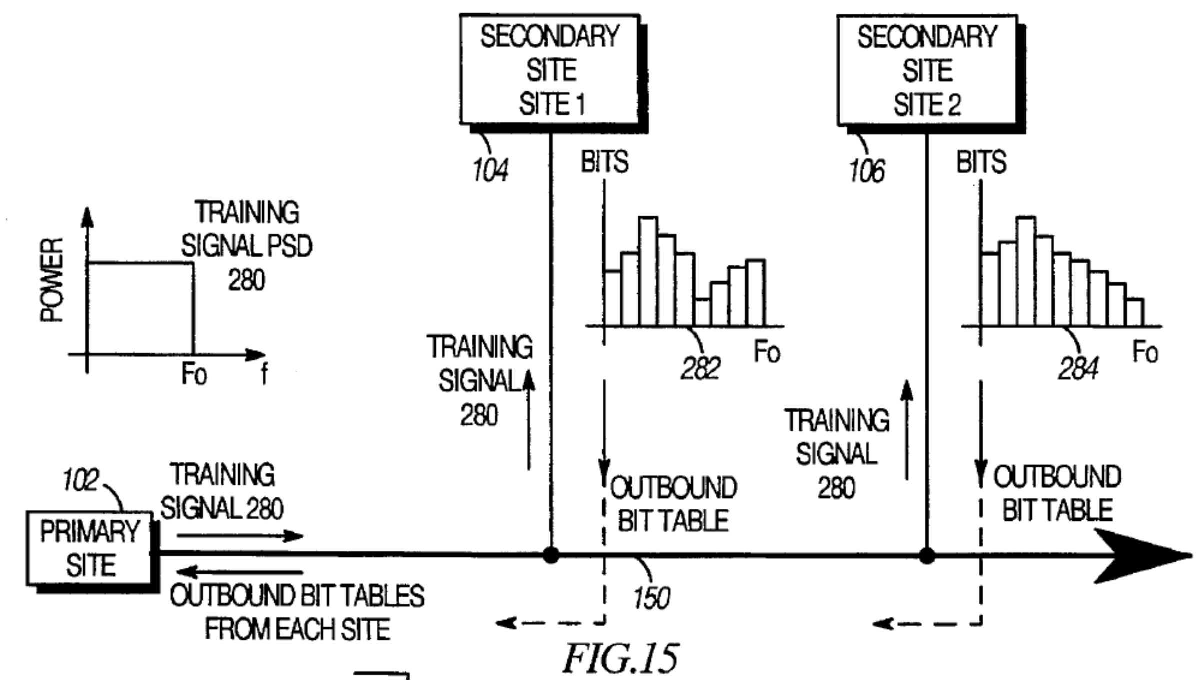
percentage of received bits in error compared to the total number of bits received").

[2g]

In Carhart-Grube, Grube's secondary sites generate response signals, which include bit-loading information, based on the characteristics of the paths that connect the primary site and each secondary site. DISH-1010, 7:32-42, 13:45-61, 16:11-23; DISH-1004, ¶¶191-95.

Grube discloses a method "for obtaining bit loading information." DISH-1010, 4:61-64, FIG. 15. Figure 15 "illustrates the process of obtaining the outbound bit loading tables from a plurality of secondary sites." *Id.*, 16:51-52.



GRUBE, FIG. 15.

DISH-1004, ¶193. Grube explains:

> [S]econdary site 104, upon receiving the training signal, ***generates a spectral response*** for each of the sinusoidal signals of the training signal 280. ***From the spectral response, the secondary site determines a bit loading*** for each of the carrier channel to produce a bit loading table 282.

DISH-1010, 16:61-65. Thus, Grube's secondary sites (i.e., the claimed receiving nodes), generate a response signal that includes bit-loading information in response determining the transmission characteristics of a channel. *Id.* Bit-loading information determined at a secondary site is transmitted "back to the primary site 102." *See id.*, 17:5-8. A POSITA would have understood, and found obvious, that Grube's response signal from the secondary sites to the primary site would have utilized the bit-loading information for the channel by including the information in the response signal. DISH-1004, ¶¶193-94. Specifically, Grube's secondary sites analyze the training signal to determine the channel's capability to carry information. A POSITA would have found it obvious for the response signal from the secondary sites to use the bit-loading determined for the channel, to improve the primary site's ability to receive the bit-loading information included in the response. *Id.*

[2h]-[2j]

Elements [2h]-[2j] are verbatim copies of elements [1h]-[1j]. Neither the additional elements of claim 2, nor any other claim, impart any substantive nuance upon elements [2h]-[2j]. Thus, Grube discloses or renders obvious elements [2h]-[2j] for the reasons provided above. *See* §IV.A.4[1h]-[1j]; DISH-1004, ¶¶196-99.

6. Claim 3

[3pre]-[3g]

Elements [3pre]-[3g] are verbatim copies of elements [1pre]-[1g]. No additional claim elements or other claims impart any substantive nuance upon these elements. Thus, Carhart-Grube renders obvious elements [3pre]-[3g] for the reasons provided above. *See* §IV.A.4[1pre]-[1g]; DISH-1004, ¶¶200-02.

[3h]

Element [3h], unlike other elements, measures PER rather than SNR or BER.[12]

[12] PER measures the number of packets received with errors in relation to the total number of packets transmitted. DISH-1004, ¶269; DISH-1018 (PER is "[t]he number of packets corrupted per unit time. PER = Packets in error/Total packets transmitted").

However, PER, like SNR and BER, was well-known in the art such that measuring PER to determine the characteristics of the transmission path represents a simple choice between well-known techniques. DISH-1004, ¶¶206-09; DISH-1030 (Heath also shows that using SNR, BER, and PER to measure channel characteristics was known and that these concepts can be used to select a modulation scheme).

Flammer, for instance, discloses characterizing communication between two nodes with various "performance metric[s]" including "a probability of a packet error in the signal at the receiving node," i.e., PER. DISH-1014, 3:20-28; DISH-1004, ¶208. Specifically, Flammer discloses an "interconnected mesh of data-packet sending and receiving nodes" that each develop "performance metrics between [a node] and other regularly-linked nodes." DISH-1014, 4:21-44. Based on the performance metrics—including PER—the nodes "dynamically vary one or more signal characteristics of signals transmitted to other nodes … to maintain the highest possible network speed." *Id.* Thus, like the '759 patent, Flammer measures the "probability of a packet error in the signal," *id.* 3:24-26, to optimize net throughput on a link, which is consistent with selecting a higher-order QAM. *See* DISH-1014, 2:64-3:5; DISH-1004, ¶¶208.

At bottom, Flammer, like Grube, Shibutani, Cai, and the '759 patent, uses transmission characterization to ensure reliable communication and optimize

throughput on a network. Flammer's disclosure of PER simply reflects one well-known metric available to determine the transmission characteristics of the channel. As such, based on a POSITA's general knowledge, and Grube's teachings, it would have been obvious to use PER to characterize a channel in Carhart's LAN, and ultimately determine a common bit-loading scheme. DISH-1004, ¶¶209-10.

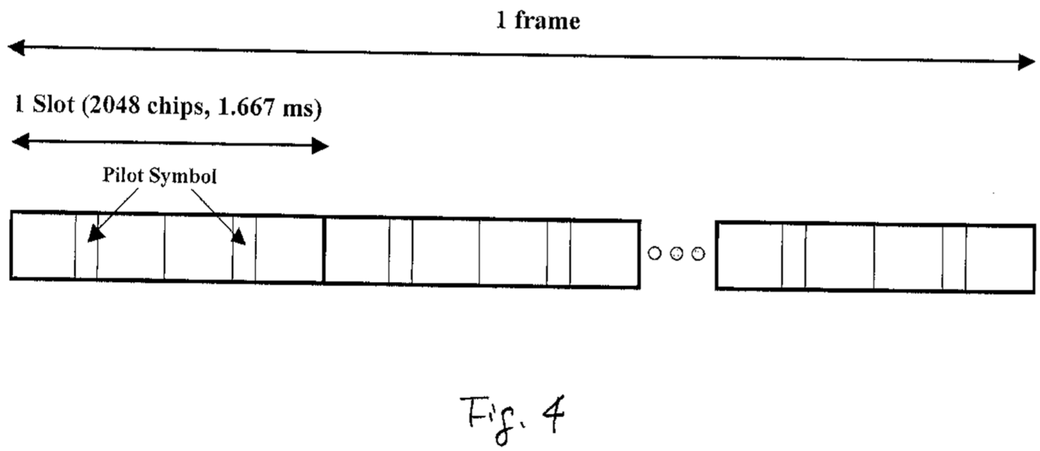
[3i]-[3k]

Elements [3i]-[3k] are verbatim copies of elements [1h]-[1j], respectively. No additional claim elements or other claims impart any substantive nuance upon these elements. Thus, Grube discloses elements [3i]-[3k] for the reasons provided above. *See* §IV.A.4[1h]-[1j]; DISH-1004, ¶¶211-13.

B. GROUND 2: Carhart in view of Grube and Shibutani

1. Shibutani

Shibutani discloses a method for ensuring access terminals (e.g., ATs, cell phones) receive a minimum quality of service from an access point (e.g., AP, a base station). DISH-1012, Abstract; DISH-1004, ¶¶214-22. Shibutani, like Grube, characterizes channel conditions between primary and secondary sites. DISH-1012, ¶11. To do so, Shibutani's AP partitions a "wireless digital data communication" frame to include multiple slots, including several "pilot symbol" slots. *Id.*, ¶¶37, 44. Figure 4 shows an exemplary frame having "pilot symbols":



SHIBUTANI, FIG. 4.

When Shibutani's AT receives a frame, the pilot symbols are "supplied to a channel condition detector 157." *Id.*, ¶¶44-46. "[T]he channel condition detector 157 measures a channel condition, such as an SIR (signal to interference ratio) based on the received pilot symbol and provides the channel condition information to an AT controller." *Id.*, ¶46. Shibutani adds that a POSITA "will appreciate that the channel condition detector 157 may measure other channel condition indicators, such as signal to noise ratio (SNR).... Alternatively, an error rate, such as a frame error rate (FER) or a b[i]t error rate (BER), may be used as channel condition information." *Id.*

The channel condition information is used to determine a data rate that the channel can support as well as a corresponding modulation scheme that achieves

the data rate. *Id.*, ¶¶46-47. Shibutani explains that the AT or AP maintains a table, like Table 2 below, that maps the channel condition to a "maximum data rate for the AT, and a combination of coding rate and modulation scheme that achieves the data rate." *Id.*

TABLE 2

SIR (dB)	Maximum Data Rates	Modulation Schemes	Coding Rates	DRC
−7	689.4 kbps	QPSK	1/3	1
7–11	1033 kbps	8PSK	1/3	2
11–14	1378 kbps	QPSK	2/3	3
14–16	1378 kbps	16QAM	1/3	4
16–18	2070 kbps	8PSK	2/3	5
18–	2761 kbps	16QAM	2/3	6

SHIBUTANI, ¶46 (Table 2)

The coding rate and modulation scheme information is provided to the AP, which uses the determined coding rate and modulation scheme to transmit data to the AT moving forward. For example, to deliver data to multiple ATs, the AP groups ATs based on the channel conditions (as measured by SNR, BER, FER, or other metrics). *Id.*, ¶¶11, 46, 48. The channel is then partitioned into slot groups, which are allocated to the access terminal groups. *Id.*, ¶¶11, 48. For example, "[m]ore slot groups may be allocated to allocated to the receiver groups having receivers with better channel conditions." *Id.*

2. Motivation to Combine

As with Ground 1, a POSITA starting with Carhart's coaxial network would have been motivated to use it with Grube's method of establishing a common bit-loading modulation scheme to improve network reliability and bandwidth. DISH-1004, ¶¶223-39. In particular, Grube's method of determining channel conditions between its primary and secondary nodes, generating bit-loading tables based on the channel conditions, and using the individual tables to determine a common bit-loading table for the network ensures that devices in the network are able to communicate using the highest bandwidth possible given network channel conditions. *See* §IV.A.3; DISH-1004, ¶223.

Although Grube discloses one metric for determining the condition of the channel, spectral response, a POSITA would have understood that other ways of measuring channel condition existed. *Id.*, ¶224.

For example, the '834 priority-application admits that determining "a channel response, multipath, and SNR profile from a known signal is well known in the art." DISH-1011, 14; DISH-1004, ¶225. And Ling and Gesbert, which the Examiner applied, also disclose using SNR, BER, and PER to measure the transmission characteristics of a channel path. *Id.*

In Grube, the "spectral response" is determined by transmitting a training signal—a "wide band test signal," specifically—from the primary node to a

secondary node in the network. DISH-1010, 3:43-53,15:51-16:10, FIG. 5; DISH-1004, ¶226. The secondary node receives the training signal and "analyz[es] each of the plurality of sinusoidal signals of the training signal" to determine the "spectral response." *Id.*, 15:51-16:10. "In essence, the secondary site determines the magnitude, and/or phase of the received sinusoidal signal and compares it to the magnitude and phase of the known transmitted sinusoidal signal. From the differences that occur, a spectral response can be obtained for an individual sinusoidal signal of the training signal." *Id.* Because each of the "plurality of sinusoidal signals of the training signal" corresponds to a particular channel, Grube teaches using the spectral response for each signal to determine the bit-loading for the particular channel. *Id.*; *see* DISH-1004, ¶¶83-84, 107-09.

Thus, Grube's "spectral response" effectively measures the attenuation and phase shift that results from the transmission path between a primary and secondary site. *Id.*; DISH-1004, ¶227. A POSITA, however, would have understood that other factors may impact the ability of the channel to transmit data reliably, such as the amount of noise in the channel. *Id.* Thus, while Grube's "spectral response" may provide an estimate of the channel's ability to carry a certain amount of data, selecting a bit-loading modulation scheme based on the "spectral response" alone may not ensure reliable transmissions between the primary and secondary nodes. *Id.*

Also, although a POSITA would have appreciated the benefits of Grube's spectral analysis, a POSITA would have understood the analysis is computationally intensive, insofar as it requires comparing the magnitude and phase of each sinusoid in the test signal. DISH-1004, ¶228. A POSITA, therefore, would have understood that Grube's "spectral response" would impose overhead in terms of processing time, and require that the secondary nodes have specific processing capabilities for determining the magnitude and phase shifts of each sinusoid. *Id.* For networks featuring devices with inexpensive processors (like Carhart's), a POSITA would have looked for additional characterization techniques to reduce the computational requirement of Grube's spectral analysis. *Id.*

Thus, for certain network configurations, a POSITA would have been motivated to substitute or supplement Grube's "spectral response" with additional channel-condition measurements. DISH-1004, ¶229. To that end, a POSITA would have looked to other references in the art to identify alternative or additional channel condition measurements. *Id.* Shibutani discloses several measurements that would have been known to a POSITA at the time. *Id.*

In particular, Shibutani discloses multiple "channel condition indicators," including "SIR (signal to interference ratio)," "signal to noise ratio (SNR), signal to noise and interference ratio (SNIR)[,] signal energy to noise ratio (E/N)," and

"error rate[s], such as a frame error rate (FER) or a b[i]t error rate (BER)." DISH-1012, ¶46. Each of these measurements were well-known before Shibutani published. DISH-1004, ¶230; *see* DISH-1017 (defining SNR and BER). As discussed in §IV.B.1, Shibutani uses these measurements to select an optimal modulation scheme for AP-AT communications. DISH-1012, ¶¶46-47. Given Shibutani's similar use of channel condition measurements to select a modulation scheme, a POSITA would have looked to Shibutani to improve Carhart-Grube's capability to determine a common bit-loading modulation scheme. DISH-1004, ¶230.[13]

A POSITA would have further understood that Shibutani's proposed metrics for determining the channel condition offer additional insights that Grube's "spectral response" lack. DISH-1004, ¶231. For example, SNR measures the strength of the desired signal relative to background noise. DISH-1017. A POSITA would have understood that increased noise in a communication channel lowers the receiver's ability to decode transmissions properly and increases the

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[13] Like the '759 patent, Carhart, Grube, and Shibutani are directed to the multiplex-communication-networking field. Shibutani is reasonably pertinent to the problem the inventors faced because Shibutani aims to ensure multiple devices on a network receive quality service. DISH-1004, ¶¶220-21; DISH-1012, ¶1.

likelihood that the data signal will clip. DISH-1004, ¶231. Thus, even where a communication path does not result in significant attenuation or phase shift of the signal, excessive noise may still limit the ability of the channel to carry a large number of bits. *Id.*

BER and FER are other channel measurements that focus on the receiver's reliability to decode data received over the channel. DISH-1004, ¶232. For example, BER involves comparing a training signal received over the channel to a known signal, to determine how many bit errors occurred in the transmission. DISH-1017. A channel with a higher BER cannot reliably carry as many bits as a channel with a lower BER. DISH-1004, ¶232. Thus, even where a channel may have limited attenuation, phase shifting, or noise, other factors such as a receiver filter response may limit the modulation scheme used for a given channel. DISH-1004, ¶232. Moreover, because BER and FER merely require comparison of a received bits or frames to known bits or frames, a POSITA would have understood that the processing required to determine BER or FER is less than that needed to measure SNR or Grube's "spectral response." *Id.*

A POSITA therefore would have been motivated to employ Shibutani's other channel condition measurements, such as SNR or BER, into Carhart-Grube to obtain the benefits of these alternate measurements. DISH-1004, ¶233. Further,

a POSITA would have readily understood how to use Shibutani's measurements as a substitute to Grube's "spectral response." *Id.*

As the '834 priority-application acknowledged, methods for measuring SNR were well-known. DISH-1011, 14. Measuring BER and FER is even more simplistic, as they require a simple comparison of decoded bits or frames to a known sequence. DISH-1004, ¶234. Thus, a POSITA would have readily understood how to implement such measurements in the combined Carhart-Grube system with a reasonable expectation of success. *Id.*

Further, a POSITA would have readily understood how to modify Carhart-Grube to generate bit-loading tables based on SNR or BER instead of, or in addition to, the "spectral response." DISH-1004, ¶235. As explained above, each of these measurements indicates the "number of bits that the carrier channel can support." DISH-1010, 3:51-53. While Shibutani describes that its ATs measure SNR or BER based on "pilot symbols" in a frame, a POSITA would understand that the same measurement can be performed on Grube's "training signal." DISH-1012, ¶46; DISH-1004, ¶235. Indeed, Grube's "training signal" and Shibutani's "pilot symbols" are both known signals that are compared to a received signal to perform the channel measurements. *Id.*; *see also* DISH-1012, ¶44 ("When there is no data to be sent, the only transmissions from the AP 140 over the downlink

channel are those of the pilot symbols and the periodic transmission of control information."); DISH-1010, 15:51-16:10.

Thus, a POSITA would readily modify Carhart-Grube to generate a bit-loading table based on SNR, BER, or a combination of multiple measurements (e.g., by choosing the lowest bit-loading the channel can support as indicated by the multiple measurements). DISH-1004, ¶¶236-37. Because each of these metrics was well-known at the time, it would have been obvious to a POSITA to use one or more of these metrics in Carhart-Grube. *See id.*; *KSR*; *Uber*.

A POSITA would have made such a modification with predictable results and a reasonable expectation of success, given the similarity between Grube's use of the "spectral response" and Shibutani's use of SNR, BER, or other metrics to choose an optimal modulation scheme. DISH-1004, ¶238-39. Specifically, a POSITA would have predictably found that modifying Carhart-Grube to use Shibutani's SNR or BER channel measurements allows for selecting an appropriate bit-loading modulation scheme, just as Shibutani used those metrics. *Id.*

3. Claim 1

[1pre]-[1f]

Carhart and Grube render obvious elements [1pre]-[1f] for the same reasons provided in Ground 1. *See* §IV.A.4.[1pre]-[1f]; DISH-1004, ¶¶240-45.

Shibutani illuminates that Grube's bit-loading table represents a "bit-loading modulation scheme" that is compatible with the primary-to-secondary-site channel. DISH-1004, ¶243. Shibutani explains that each of its ATs, which correspond to Grube's secondary sites, determines a maximum data rate for a channel that maps to a particular modulation scheme, as Table 2 (below) shows. For example, a channel that can support a data rate of 1378 kbps uses a corresponding modulation scheme of 16QAM. DISH-1012, ¶¶46-47.

TABLE 2

SIR (dB)	Maximum Data Rates	Modulation Schemes	Coding Rates	DRC
−7	689.4 kbps	QPSK	1/3	1
7–11	1033 kbps	8PSK	1/3	2
11–14	1378 kbps	QPSK	2/3	3
14–16	1378 kbps	16QAM	1/3	4
16–18	2070 kbps	8PSK	2/3	5
18–	2761 kbps	16QAM	2/3	6

Thus, a POSITA would have understood, or at least found obvious, that Grube's determination of "a number of bits that [a] carrier channel can support" to be determining a "bit-loading modulation scheme," e.g., a QAM order. DISH-1004, ¶¶243-44.

[1g]

If PO asserts that Carhart-Grube does not render obvious element [1g], Shibutani renders obvious determining transmission characteristics of Carhart's channel by measuring SNR characteristics of a probe signal at a receiving node. DISH-1012, ¶46 ("the channel condition detector 157 may measure … SNR[.]"); DISH-1004, ¶247.

Thus, a POSITA would have understood that in Carhart-Grube-Shibutani, each of Carhart-Grube's remote stations would measure the SNR characteristics of the "training signal" received from the central computer and use the SNR to determine the bit-loading table for the secondary site. DISH-1004, ¶248. Specifically, a POSITA would have understood the benefits in having each remote device measure SNR in place of or in addition to a "spectral response" to determine a bit-loading table for the channel path between the remote device and central device. *Id.*; §IV.B.2. A POSITA would have been motivated to do so to advantageously determine the bit-loading table that accounts for the limitations on the channel caused by noise, thereby further improving the reliability of transmissions over the channel. *Id.*

[1h]-[1j]

Elements [1h]-[1j] are rendered obvious by Carhart-Grube for the same reasons provided above. *See* §IV.A.4.[1h]-[1j]; DISH-1004, ¶¶250-52.

4. Claim 2

[2pre]-[2e]

Elements [2pre]-[2e] are rendered obvious by Carhart-Grube for the same reasons provided under Ground 1. *See* §IV.A.5.[2pre]-[2e]. Further, Shibutani illuminates that Grube's bit-loading table represents a bit-loading modulation scheme that is compatible with the channel between the secondary site and primary site. *See* §IV.B.2; DISH-1004, ¶¶253-55.

[2f]

If PO asserts that Carhart-Grube does not render obvious element [2f], Shibutani renders obvious determining transmission characteristics of Carhart's channel by measuring BER characteristics of a probe signal at a receiving node. DISH-1012, ¶46 ("b[i]t error rate (BER), may be used as channel condition information."); DISH-1004, ¶257.

In Carhart-Grube-Shibutani, a POSITA would have understood that each of Carhart's remote stations would measure BER characteristics of the "training signal" received from the central computer and use BER to determine the bit-loading table for the remote station. DISH-1004, ¶258. Specifically, a POSITA

would have understood that each remote device would be able to measure BER in place of or in addition to a "spectral response" to determine a bit-loading table for the channel path between the remote device and central device. *Id.*; §IV.B.2. Such a system would advantageously determine the bit-loading table based on the errors received in the data transmitted by the "training signal," thereby further improving the reliability of transmissions over the channel. *Id.* Further, compared to Grube's "spectral response," measuring BER is less computationally intensive. Thus, implementing a BER measurement would enable Carhart's remote devices to determine the bit-loading table more efficiently. *Id.*

[2g]-[2j]

Elements [2g]-[2j] are rendered obvious for the reasons provided above. *See* §IV.A.5.[2g]-[2j]; DISH-1004, ¶¶259-60.

5. Claim 3

[3pre]-[3g]

Elements [3pre]-[3g] are rendered obvious for the same reasons provided at elements [3pre]-[3g] of Ground 1 and elements [1pre]-[1g] of Ground 2. DISH-1004, ¶¶261-63.

[3h]

To the extent that Carhart-Grube does not render obvious element [3h], Shibutani renders obvious determining transmission characteristics of Carhart's

channel by measuring PER characteristics of a probe signal at a receiving node. DISH-1004, ¶265.

Shibutani discloses that "an error rate, such as a frame error rate (FER) … may be used as channel condition information" to determine a modulation scheme for a channel between network devices. DISH-1012, ¶46. A POSITA would have understood that a frame is a data construct including a packet for transmitting data over a network. *See* DISH-1004, ¶¶266-68; DISH-1019 (Webster's) (defining a frame "[i]n data communications" as "a unit (packet) of data that is transmitted via the network" and defining a packet "[i]n a packet-switching unit" as "a unit of data of a fixed size … that has been prepared for network transmission"); DISH-1017 (defining "frame" and "packet"). Further, FER is a measure of the rate of errors detected in frames. *Id.*; DISH-1017 (defining FER as "[t]he ratio of errored data frames to the total number of frames transmitted"). Similar to FER, PER is determined by calculating frames corrupted per unit time. DISH-1004, ¶269; DISH-1018 (Sharda) ("***Packet error rate (PER):*** The number of packets corrupted per unit time. PER = Packets in error/Total packets transmitted."). Based on Shibutani's disclosure of measuring a channel's transmission characteristics using FER, it would have been similarly obvious to determine a channel's transmission characteristics by using PER rather than FER. DISH-1004, ¶269. *See KSR*; *Uber*.

In Carhart-Grube-Shibutani, a POSITA would have understood that each of Carhart's remote devices would be able to measure PER characteristics of the "training signal" received from the central computer and use the PER to determine the bit-loading table for the channel to the remote device. DISH-1004, ¶270. Specifically, a POSITA would have understood the benefits of having each remote device measure PER in addition to SNR, and further in addition to or in place Grube's "spectral response," to determine a bit-loading table for the DMT channel. *Id.*; §IV.B.2. Such a system would advantageously determine the bit-loading table based on the errors in the packets transmitted by the "training signal," thereby improving the reliability of transmissions over the channel. *Id.*

[3i]-[3k]

Elements [3i]-[3k] are rendered obvious for the same reasons provided above. *See* §IV.A.6.[3i]-[3k]; DISH-1004, ¶¶272-274.

C. GROUND 3: Carhart in view of Grube and Cai

1. Cai

Cai explains that in conventional DMT systems, SNR is measured to determine optimal bit-loading for each channel. DISH-1013, 1:33-43, 2:62-3:3; DISH-1004, ¶¶275-79. Conventionally, once SNR is measured, a fixed margin is subtracted to achieve a desired bit-error rate. DISH-1013, 1:44-48.

Cai notes that this traditional approach "suffer[s]" because the fixed margin may be too great, thus slowing transmission in a channel, or too little, thus yielding a high bit-error rate in a channel. *Id.*, 1:48-62. To solve this problem, Cai teaches using a variable margin for each DMT channel, e.g., in a DMT modem. *Id.*, 1:19-43, 1:65-2:4, 3:11-13 ("varying margins allow the DMT channels to be used with a maximum of efficiency, while ensuring a low bit error rate."), 3:14-32, 4:51-5:20, FIGS. 3-4. To obtain a variable margin, Cai observes how SNR changes relative to (1) mean channel SNR, (2) the last measured SNR value, (3) the initial measured SNR value, or (4) a periodic sampling. *Id.*, 5:15-34, 6:61-13, 8:1-7, 8:16-21. When the variation has been determined, "the optimum margins are calculated for each DMT channel, which in turn translates into an optimum bit rate for each DMT channel while ensuring a desired bit error rate which is, for example, 10^{-7}." *Id.*, 9:39-49. Cai thus uses SNR measurements to optimize bit rate while minimizing error.

2. Motivation to Combine

A POSITA starting with Carhart's coaxial network would have been motivated to use it with Grube's method of establishing a common bit-loading modulation scheme to improve network reliability and bandwidth. *See* §IV.A.3; DISH-1004, ¶280. A POSITA would have been motivated to optimize Carhart-

Grube by using alternative channel measurements, such as SNR, BER, or FER to determine the bit-loading modulation scheme. *See* §IV.B.2.[14]

Like Carhart, Cai seeks to optimize performance in modems. DISH-1013, 1:19-43, 1:65-2:4, 3:14-32, 4:51-5:20, FIGS. 3-4; DISH-1004, ¶¶280-81. Cai shows that using SNR to optimize bit rate, while minimizing transmission error, over a channel was well-known and desired. In particular, Cai explains that it enables determining the "optimum bit rate for each DMT channel while ensuring a desired bit error rate which is, for example, 10^{-7}." DISH-1013, 9:46-49; DISH-1004, ¶281. Accordingly, a POSITA would have been motivated to use, or to try, Cai's method of using SNR to characterize a channel path, and ultimately determine a bit-loading modulation scheme based on SNR. DISH-1004, ¶281. A POSITA would have readily understood how to modify Carhart-Grube to use Cai's method(s) because Cai improves DMT systems, and Grube is a DMT system. *Id.* Thus, a POSITA would have found implementing Cai in Grube a predictable

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[14] Like the '759 patent, Carhart, Grube, Shibutani, and Cai are from the multiplex-communication-networking field. Cai is reasonably pertinent to the problem the inventors faced because Cai aims to optimize bit-loading schemes, which facilitates communication between network devices. DISH-1004, ¶¶278-79; DISH-1013, Abstract.

exercise, and would have had a reasonable expectation of success in implementing Cai because both references are directed to DMT. *Id.* In doing so, a POSITA would achieve a system that optimizes per symbol while reducing bit errors. *Id.*

3. Claim 1

[1pre]-[1f]

Elements [1pre]-[1f] are rendered obvious by Carhart and Grube for the same reasons provided in Ground 1. *See* §IV.A.4.[1pre]-[1f]; DISH-1004, ¶¶282-84.

[1g]

Cai renders obvious determining transmission characteristics of Carhart-Grube's channel by measuring SNR characteristics of a probe signal at a receiving node. DISH-1013, 1:19-62, 2:62-3:3; DISH-1004, ¶¶286-88. Cai teaches that conventional DMT systems use SNR to determine transmission characteristics:

> Referring to FIG. 1, shown is a graph 50 which details the signal-to-noise ratio (SNR) of the channels of a conventional discrete multi-tone (DMT) data link. For each DMT channel, a measured SNR 53 is shown. A common SNR margin 56 is subtracted from the measured SNR 53 for each DMT channel resulting in an SNR threshold 59. The SNR threshold 59 is the signal-to-noise ratio employed to achieve a 10^{-7} bit error rate at the selected bit rate per each DMT channel.

Id., 2:62-3:3. Cai then improves on the conventional approaches of using SNR by varying the SNR margin in each channel, which would motivate a POSITA to use Cai's improvements in Carhart-Grube. *Id.*, 3:4-13, 5:15-34, 6:61-7:13, 8:1-7, 8:16-21, 9:39-49 (touting advantages); DISH-1004, ¶288. Thus, Carhart-Grube-Cai renders obvious element [1g].

[1h]-[1j]

Elements [1h]-[1j] are rendered obvious for the reasons provided above. *See* §IV.A.4[1h]-[1j]; DISH-1004, ¶¶290-91.

D. GROUND 4: Carhart in view of Grube, Shibutani and/or Cai, and further in view of Flammer

1. Flammer

Flammer discloses a "mesh network communication system," shown in Figure 1. *Id.*, Abstract; DISH-1004, ¶¶292-97. In the network, "throughput is optimized on the link between the communicating nodes by dynamically modifying signal characteristics of the signals transmitted between nodes in response to performance metrics which have been determined from analysis at the receivers for the corresponding links." *Id.*, Abstract, 2:64-3:5.

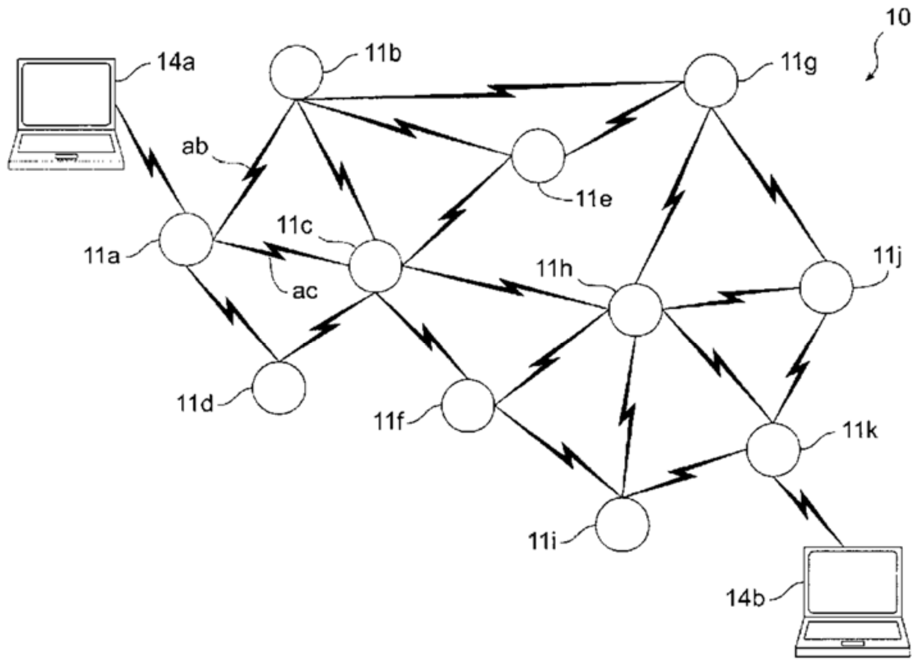

FIG. 1

FLAMMER, FIG. 1.

Initially, "each node 11 (for example, Nodes A and B) operates at a default data rate in order to establish a pair of links, such as Link A=>B and Link B=>A." *Id.*, 4:30-45. "Each … node 11 monitors traffic and the success of traffic… and constantly develops performance metrics between itself and other regularly-linked nodes." *Id.* The "performance metrics" may include "… a probability of a bit error in the communication … a probability of a packet error in the signal at the receiving node[.]" *Id.*, 3:6-30. Based on the performance metrics, "[e]ach node 11 may … vary one or more signal characteristics of signals transmitted to other nodes 11 on a per-link basis to maintain the highest possible network speed." *Id.*,

4:30-45. The "signal characteristics" may include data rate, modulation type, etc. *Id.*, 3:16-31.

While Flammer provides an exemplary "on-air" network application, Flammer is not limited to such networks. DISH-1004, ¶295. Indeed, Flammer states that its "method is very general in its application to semi-autonomous nodes communicating within a data communications network." DISH-1014, 7:66-8:11.

2. Motivation to Combine

As explained in §IV.A.3, a POSITA starting with Carhart's coaxial network would have been motivated to use it with Grube's method of establishing a common bit-loading modulation scheme to improve network reliability and bandwidth. DISH-1004, ¶¶298-303. And as explained in §IV.B.2 and §IV.C.2, a POSITA would have been motivated to improve Carhart-Grube to use channel measurements other than "spectral response," such as Shibutani's SNR, BER, or FER, or Cai's SNR, for selecting the bit-loading modulation scheme.

In addition to the Carhart-Grube-Shibutani/Cai measurements of "spectral response," SNR, BER, and FER, a POSITA would have known that there were additional channel measurements that provided different insights than the Carhart-Grube-Shibutani/Cai measurements. DISH-1004, ¶299. The POSITA would have sought to employ these measurements to capture the channel assessments not captured by the Carhart-Grube-Shibutani/Cai measurements. *Id.* For example,

Flammer discloses several channel performance metrics including a probability of a packet error in a signal at the receiving node ("PER"). DISH-1014, 3:6-30. Similar to Shibutani's FER measurement, a POSITA would have understood that Flammer's PER assesses the number of packets received with errors in relation to the total number of packets transmitted in the signal. DISH-1004, ¶299; DISH-1019; DISH-1017. A POSITA would have further understood that PER, like Shibutani's FER, provides a higher level of granularity of channel assessment than other metrics, such as BER (which assesses the channel on a bit level). DISH-1004, ¶299.[15]

A POSITA therefore would have been motivated to employ Flammer's PER approach in Carhart-Grube-Shibutani/Cai to obtain the benefits of using PER when determining a bit-loading modulation scheme. DISH-1004, ¶300. Indeed, Flammer explains that PER can be used to determine the modulation type for a channel. *Id.*; DISH-1014, 3:16-31, 4:30-45.

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[15] Like the '759 patent, Carhart, Grube, Shibutani, and Cai, Flammer is from the multiplex-communication-networking field. Flammer is reasonably pertinent to the problem the inventors faced because Flammer aims to optimize throughput over a channel, which facilitates communication between network devices. DISH-1004, ¶¶296-97; DISH-1014, 2:64-3:5.

A POSITA would have readily understood how to supplement Carhart-Grube-Shibutani/Cai's techniques with Flammer's PER approach. DISH-1004, ¶301. A POSITA would have understood that Carhart's coaxial LAN communicates using data packets, and that Grube and Shibutani disclose specific frame formats for their packet-switched networks. *Id.*; *see* DISH-1010, 3:18-4:26, FIGS. 20-21, 34, 40, 51, 55-57, 62; DISH-1012, ¶38, FIG. 4. Thus, instead of measuring the error rate in the bits or frame of a training signal, a POSITA would have found it obvious to instead, or also, measure the error rate in the packets of the training signal. The PER measurement is as simple as the BER and FER measurements described previously. DISH-1004, ¶301.

Further, a POSITA would have readily understood how to modify Carhart-Grube-Shibutani/Cai to generate bit-loading tables using PER instead of or in addition to the Carhart-Grube-Shibutani/Cai metrics. DISH-1004, ¶302. As explained above, channel measurements are an indication of the "number of bits that the carrier channel can support." DISH-1010, 3:51-53. Thus, a POSITA would readily modify Carhart-Grube-Shibutani/Cai to generate a bit-loading table based on PER, SNR, BER, FER, or a combination of multiple measurements (e.g., by choosing the lowest bit-loading the channel can support as indicated by the multiple measurements). DISH-1004, ¶302. Because each of these metrics was well-known at the time, it would have been obvious to a POSITA to implement

one or more of these metrics in the Carhart-Grube-Shibutani/Cai-Flammer system. *See id.*; *KSR*; *Uber*.

A POSITA would have made such a modification with predictable results and a reasonable expectation of success, given the similarity between different metrics, to choose an optimal modulation scheme. DISH-1004, ¶303. Specifically, a POSITA would have predictably found that modifying Carhart-Grube-Shibutani/Cai to use Flammer's PER channel measurements would allow for the selection of an appropriate bit-loading modulation scheme. *Id.*

3. Claim 3

[3pre]-[3g]

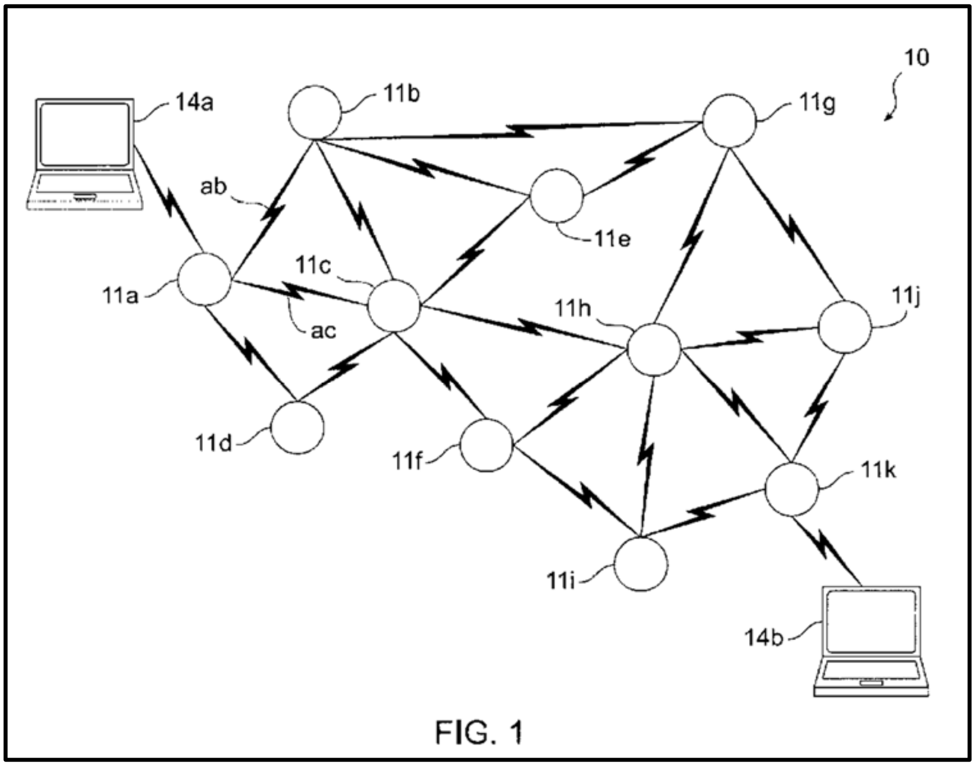
Elements [3pre]-[3g] are rendered obvious by Carhart-Grube, or Carhart-Grube-Shibutani/Cai for the reasons provided above. *See* §IV.A.6.[3pre]-[3g]; §IV.B.5.[3pre]-[3g]; §IV.C.3.[1pre]-[1g]; DISH-1004, ¶¶304-306.

[3h]

To the extent that Carhart-Grube-Shibutani/Cai does not render obvious element [3h], Flammer establishes it would have been obvious to determine transmission characteristics of Carhart's channel by measuring PER at a receiving node. DISH-1014, 3:6-30; DISH-1004, ¶307-11.

Specifically, Flammer discloses a "mesh network communication system" as shown in Figure 1. DISH-1013, Abstract; DISH-1004, ¶309. In the network, "net

throughput is optimized on the link between the communicating nodes by dynamically modifying signal characteristics of the signals transmitted between nodes in response to performance metrics which have been determined from analysis at the receivers for the corresponding links. *Id.*, Abstract, 2:64-3:5.



FLAMMER, FIG. 1.

"Each … node 11 monitors traffic and the success of traffic, as indicated by repetitions, information on lost packets, and the like, and constantly develops performance metrics between itself and other regularly-linked nodes." *Id.*; DISH-1004, ¶310. Flammer teaches the benefits of having the "performance metrics"

include "probability information," such as "a probability of a packet error in the signal at the receiving node." *Id.*, 3:6-30.

In Carhart-Grube-Shibutani/Cai-Flammer, a POSITA would have understood that each of Carhart's remote stations would measure PER characteristics of the packets received in the training signal from the primary site and use the PER to determine the bit-loading table for the secondary site. DISH-1004, ¶311. Specifically, as explained in §IV.D.2 above, a POSITA would have understood that each of Carhart's modified remote stations measures PER in addition to or instead of SNR and/or "spectral response" to determine a bit-loading table for the channel path between the remote station and central computer. *Id.* A POSITA would have been motivated to do so to determine the bit-loading table based on the errors actually received in the packets in the training signal transmitted over the channel, thereby further improving the reliability of transmissions over the channel. *Id.*

[3i]-[3k]

Elements [3i]-[3k] are rendered obvious for the reasons provided above. *See* §IV.A.6[3j]-[3k]; DISH-1004, ¶¶313-15.

4. Claim 2

[2pre]-[2e]

Elements [2pre]-[2e] are rendered obvious by Carhart-Grube, for the same reasons provided at elements [2pre]-[2e] of Grounds 1 and 2. DISH-1004, ¶¶316-18.

[2f]

If PO asserts that Carhart-Grube or Carhart-Grube-Shibutani/Cai does not render obvious element [2f], Flammer's teachings establish it would have been obvious to determine transmission characteristics of Carhart's channel by measuring BER at a receiving node. DISH-1014, 3:6-30; DISH-1004, ¶319.

As noted above, Flammer teaches the benefits of having the "performance metrics" include "probability information," and Flammer discloses using BER or PER. *See* DISH-1014, 3:6-30 ("a probability of a bit error in the communication upon receipt at a receiving node"—BER packet error in the signal at the receiving node"—PER—is listed as an viable alternative to PER); DISH-1004, ¶¶320. Thus, a POSITA would have understood that Carhart's remote stations would be able to measure BER characteristics of the packets received in the training signal from the primary site and use BER to determine the bit-loading table for the remote stations. *Id.* A POSITA would have been motivated to use BER for largely the same

reasons as using PER, e.g., to improve the reliability of transmissions over the channel. *Id.*

[2g]-[2j]

Elements [2g]-[2j] are rendered obvious for the reasons provided above. *See* §IV.A.5.[2g]-[2j]; DISH-1004, ¶¶322-23.

V. DISCRETIONARY DENIAL IS UNWARRANTED

A. The *Fintiv* Factors Favor Institution

Institution is consistent with the Director's guidance on applying *Fintiv*. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential); *Memorandum: Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation* (June 21, 2022) ("*Director's Guidance*"). A holistic analysis of the *Fintiv* framework favors institution.

1. Factor 1: Institution Supports Stays in Parallel Proceedings

Should the Board institute this proceeding, DISH will move to stay the District Court case, which will likely be granted. *CAO Lighting, Inc. v. Signify N. Am. Corp.*, No. CV 21-08972-AB (SP), 2022 WL 20563918, at *2 (C.D. Cal. Dec. 21, 2022) (recognizing "near uniform line of authority reflecting the principal that after the PTAB has instituted review proceedings, the parallel district court litigation ordinarily should be stayed"). Institution and stay of the several

litigations asserting the ’759 patent would enable the Board to resolve the ’759 patent’s validity, and relieve the District Court of the need to continue with the companion litigation for this patent. This opportunity for simplification increases the likelihood that the court will grant a stay in view of IPR institution. *C.R. Laurence Co. v. Frameless Hardware Co.*, 2:21-cv-01334-JWH-RAO (CDCA, December 9, 2022); *Guy A. Shaked Investments, Ltd. v. Trade Box, LLC*, 2:19-cv-10593-AB-MAA (CDCA, November 18, 2020); *Masimo Corp. v. Apple Inc., 8:20-cv-00048-JVS-JDE* (CDCA, October 13, 2020) (all granting motions to stay pending IPRs).

2. Factor 2: The Board’s Final Written Decision Will Likely Issue in Advance of Any Foreseeable Trial

The District Court case was filed on February 10, 2023, but due to multiple motions to dismiss, DISH filed its Answer on September 21, 2023. The trial date has not been set. Over all civil cases, the last-reported median time to trial in CDCA was 28.4 months. DISH-1020 (median time to trial in CDCA is 28.4 months). However, the median time to trial for CDCA patent cases in 2023 is **34.4 months**. DISH-1021. The anticipated July 2025 Final Written Decision (“FWD”) would likely be before a median time-estimated trial date in December 2025 (based on 34 months).

Moreover, the Court set the Claim Construction Hearing for September 17, 2024. DISH-1022. The case likely will not be ready for trial before a July 2025 FWD, given that multiple key milestones must be completed in the nine months following claim construction, such as close of fact discovery, expert discovery, dispositive motions, etc. Regardless, because this filing precedes a trial-scheduling order, the District Court may set its schedule to ensure trial follows a FWD.

In sum, the uncertainty of a trial date and the strong likelihood that the FWD will issue before trial weigh in favor of institution. And, even if not, "the proximity to trial should not alone outweigh" other relevant factors. *Director's Guidance*, 8.

3. Factor 3: DISH's Diligence Outweighs the Parties' Investment in the Litigation

The District Court proceeding is in its early states, and the parties' and court's investment has been minimal. Indeed, as discussed above, the Court has not issued a full schedule, and claim construction briefing is six months away. DISH-1022.

PO asserted twelve patents in its Complaint. Ten remain after the Court found two patents ineligible. Further, PO just recently served infringement contentions (September 29, 2023), which first disclosed the full list of asserted

claims.[16] Despite this volume and late notice of asserted claims, DISH diligently prepared multiple IPR petitions and is filing them significantly earlier than the one-year statutory bar date.

DISH's substantial investment in its IPR petitions outweighs the minimal resources invested in the co-pending litigation. The minimal resources expended in district court have been borne equally by both parties, unlike the significant resources expended by DISH to prepare its petitions—effort that would be irretrievably lost without consideration of these petitions on the merits, in addition to the extensive expenses DISH will accrue in the remaining portion of the co-pending litigation.

In sum, this Petition was filed before the one-year statutory bar date and well before any party has made a substantial investment in the district court litigation. *Mylan Pharms. Inc. v. Sanofi-Aventis Deutschland GmbH*, IPR2018-01680, Paper 22 at 18 (PTAB Apr. 3, 2019) (finding that petition filed two months before bar date is "well within the timeframe allowed by statute, weighing heavily in [DISH's] favor"). DISH's diligence in filing this Petition shortly after receiving PO's initial infringement contentions and at an early stage of the companion

[16] PO's complaint identified just a single claim for each of the multiple asserted patents.

litigation favors institution. *See Apple Inc. v. Seven Networks LLC*, IPR2020-00156, Paper 10 at 11-12 (PTAB Jun. 15, 2020) (finding factor 3 in Petitioner's favor where "Petitioner did not wait until the eve of the statutory bar date to file the Petition"); *Sotera Wireless, Inc. v. Masimo Corp.*, Paper 12 at 16-17 (PTAB Dec. 1, 2020) (comparing investment in district court case with IPR petitions to find factor 3 in Petitioner's favor).

4. Factor 4: The Petition Raises Unique Issues

DISH asks the Board to consider the unique challenges raised in the Petition. *See Fintiv*, 12-13. If the Board institutes the pending Petition, DISH will not pursue district-court invalidity challenges based on the same grounds in this petition pursuant to 35 U.S.C. §315(e), thereby eliminating any risk of duplicated effort between the litigation and the IPR.

5. Factor 5: DISH's Involvement in Parallel Proceedings

The parties are the same in this IPR and in the parallel District Court proceeding.

6. Factor 6: The Merits Support Institution

As *Fintiv* noted, "the factors … are part of a balanced assessment of all the relevant circumstances in the case," and, "if the merits of a ground raised in the petition seem particularly strong … [instituting IPR] may serve the interest of overall system efficiency and integrity…." *Fintiv*, 14-15. As explained in the

Petition (with expert testimony from Dr. Williams), the grounds raised herein are strong, and institution would result in invalidation of the Challenged Claims.

B. *Advanced Bionics* Favors Institution

Advanced Bionics strongly favors institution. *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 (PTAB Feb. 13, 2020) (precedential).

This Petition's prior art references were not considered or cited in the prosecution of the '759 patent, and the principal references presented are materially different from those the Examiner relied upon. *See* generally DISH-1005; DISH-1001. Additionally, the Office address did not address through substantially similar prior art, the obviousness combinations this Petition presents. Thus, this Petition does not involve the same or substantially the same prior art or arguments previously presented to the Office. The Grounds above demonstrate why further consideration is warranted.

VI. CONCLUSION

DISH respectfully requests the Board institute IPR and cancel claims 1-3.

VII. FEES

Please apply any fees to Deposit Account No. 06-1050.

VIII. MANDATORY NOTICES

A. Real-Party-In Interest

DISH Network L.L.C. is petitioner and real party-in-interest. DISH Network Corporation, Dish Network Service L.L.C., and Dish Network California Service Corporation are additional real parties-in-interest. No other party had access to or control over the filing of this Petition, and DISH did not file this Petition for the benefit of any other party or entity.

B. Related Matters

DISH is not aware of any disclaimers, reexamination certificates, or petitions for *Inter Partes* Review for the ’759 patent.

DISH is aware of the following civil actions involving the subject matter of the ’759 patent.

Case Number	Filing Date
Entropic Communications, LLC v. DirecTV, LLC f/k/a DirecTV, Inc. et al., 2-23-cv-05253 (CDCA)	July 1, 2023
Entropic Communications, LLC v. DISH Network Corporation et al., 2-23-cv-01043 (CDCA)	February 10, 2023
Entropic Communications, LLC v. Cox Communications, Inc. et al., 2-23-cv-01047 (CDCA)	February 10, 2023
Entropic Communications, LLC v. Comcast Corporation et al., 2-23-cv-01048 (CDCA)	February 10, 2023
Entropic Communications, LLC v. Charter Communications, Inc., 2-23-cv-00050 (EDTX)	February 10, 2023
Entropic Communications, Inc. v. ViXS Systems, Inc. et al., 3-13-cv-01102 (SDCA)	May 8, 2013

C. Lead and Backup Counsel

DISH designates the following counsel:

Lead Counsel	Backup Counsel
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D. Service Information

Please address all correspondence and service to the address listed above.

DISH consents to electronic service by email at IPR45035-0026IP1@fr.com.

Dated: January 22, 2024

Respectfully submitted,

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CERTIFICATION UNDER 37 C.F.R. § 42.24

Under the provisions of 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter partes* Review totals 13,912 words, which is less than the 14,000 allowed under 37 C.F.R. § 42.24.

Dated: January 22, 2024

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on January 22, 2024, a complete and entire copy of this Petition for *Inter partes* Review, Power of Attorney, and all supporting exhibits were provided via Federal Express, to the Patent Owner by serving the correspondence address of record as follows:

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